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DEPARTMENT OF MINES

GEOLOGICAL SURVEY BRANCH

Hon. W. Templeman, Minister; A. P. Low, Deputy Minister;
R. W. Brock, Director.

MEMOIR No. 8—E

THE EDMONTON COAL FIELD

ALBERTA

BY

D. B. Dowling.

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To R. W. Brock, Esq.,
Director Geological Survey,
Department of Mines.

Sir,—I beg to submit the following preliminary memoir on the coal field at Edmonton.

I have the honour to be, Sir,
Your obedient servant,

(Signed) **D. B. Dowling.**

Ottawa, June 12, 1909.

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MEMOIR

ON THE

EDMONTON COAL FIELD

BY

D. B. Dowling.

INTRODUCTORY.

In the opening out of the northwest to civilization, some of the settlements soon developed into thickly populated communities; due to various causes. Among these may be mentioned, (1) advantageous situations as regards transportation; (2) importance of the location agriculturally, or as a mining centre; and (3) strategic position for a capital city. Each of the foregoing causes may be contributory factors in the growth of a town.

Edmonton is a typical instance of natural selection; for it is situated on the banks of a navigable river, at a point where goods for trading with the fur hunters could be expeditiously brought. Other trading posts were established on the banks of the Saskatchewan, but Edmonton has progressed more rapidly than any: doubtless in accordance with the law of the survival of the fittest.

But in time the fur trade was eclipsed by agricultural development in the district; and railway communication greatly accelerated the progress of the settlement. Its transformation, however, from a town into the capital city of the Province; together with the advent of competing railways, have been the most important factors in making for its recent phenomenal growth.

In addition to the advantages cited, Edmonton now promises to be the centre of a flourishing coal mining industry; for in the vicinage coal seams have been discovered capable of being worked economically, and on a commercial scale, and are now being exploited.

Natural exposures of fossil fuel in the region of Edmonton have already been described by Mr. J. B. Tyrrell and others; but the results of recent drillings and shaft excavations awaited compilation and publicity. The object of this memoir is, to set forth the information gathered during a visit to the locality in the autumn of 1908. In the collection of data and facts relative to the occurrences of coal and the records of bore holes, I have to express my indebtedness to Mr. Norman Fraser, Inspector of Mines; Mr. Frank B. Smith, Mining Engineer; Mr. Charles Taylor, Superintendent Edmonton Street railway, and to Mr. G. A. Reid of the Registry Office; all of whom generously imparted valuable information which they had gained by personal observation of actual conditions at the points I was unable to visit.

Location and Area.

Edmonton is situated on the banks of the Saskatchewan river, and as this stream has cut a valley here over 165 feet deep, exposures of the underlying strata are frequent. Coal seams of workable dimensions occur at Clover Bar, five miles east of the city, and continue with a slight westerly dip, underneath the town. The total area over which this coal can be mined is not restricted to the banks of this stream, but forms a wide band running northwesterly and southeasterly. The present report deals more particularly with the vicinity of Edmonton, but information relative to other coal outcrops and coal mines of the surrounding district will also be included.

Bibliography.

Mention of the coal at Edmonton is to be found in several publications, mainly books of travel, but the first and only complete geological examination of the district was made by Mr. J. B. Tyrrell in 1885 and 1886, and published as Part E, Vol. II, Annual Report Geological Survey, 1886. Details of production are to be found in the Annual Reports of the Minister of Public Works for Alberta, and, previous to the creation of the Province, in the reports for the North West Territory.

Object of Present Investigations.

For many years mining has been carried on by drift levels from the banks of the river and no attempt at correlation of the seams has been made. The present hurried investigation aims to be a compilation of the number of seams, their thickness, characters, and the amount of covering over them.

SUMMARY AND CONCLUSION.

The Edmonton formation is coal bearing throughout in the latitude of Edmonton. The upper part, which is exposed for sixty miles up the Saskatchewan west of Edmonton, contains some of the thickest seams. The top of the formation is marked by a persistent coal horizon, and seams are found at intervals in the measures, but apparently not in heavy continuous seams. At Edmonton a fairly persistent coal horizon is again found. From this horizon to the base of the formation coal deposits are irregular and do not appear to be continuous over large areas. At Edmonton the seam which crops out of the bank at Clover Bar, to the east of the town, is the most persistent, and the only one, apparently, that can be relied upon over any extended area. The thickness of this seam, although as great as 8 feet at Clover Bar, does not average much over 5 feet for the district, and in local sections it decreases, for small areas, to scarcely workable dimensions. Beneath, at a further depth of between 15 and 20 feet, there is evidence of another seam, but whether it is a splitting of the Clover Bar seam or an additional one has not been fully proven. This lower one runs from 4 to 7 feet in thickness.

Available Coal.

These two seams appear to be persistent enough to warrant the prediction that about 9 feet of coal should be mineable over the area extending from Clover Bar to past Edmonton along the river, and approximately for a mile on either side. This would give for the whole area of fourteen square miles in the immediate vicinity of Edmonton, a total available tonnage, if mined economically—that is without undue waste—of 80,000,000 tons.

Character of Coal.

All the analyses show the coals of this vicinity to be in the lignite class (sub-bituminous of the United States Classification) which although excellent fuels for domestic and power purposes, require care in shipment and storage. Excessive exposure to dry air removes the natural moisture too readily, and the coal breaks up. Storage under cover, however, prevents much of this waste. Moreover, experiments have shown that this coal used in the gas producer of the down draught type is more economical for power production than the best grade under the steam boiler.

GENERAL CHARACTER OF THE DISTRICT.

Topography.

The greater portion of the Edmonton district is a rolling plain of low relief, partly wooded; the surface features of which are due to the erosion of soft rocks consisting of sandstones and shales; through this plain the easterly flowing waters of the Saskatchewan have worn the deep channel which the river occupies. At Edmonton this depression, amounting to nearly 160 feet and from crest to crest a distance of about three-quarters of a mile, separates the city from Strathcona, on the south bank.

This valley, with supplementary branch valleys, forms the principal topographical feature of the district. Other streams which cross the coal-bearing belt also have valleys which form important features; but for the coal mining industry their importance arises principally from their erosive action, which by wearing away the confining walls of the valleys exposes the coal seams so that mining can be cheaply carried on by level entries.

Transportation.

The city of Edmonton is becoming an important railway centre; from it radiating lines already built and under construction give connexion eastwards with the other provinces by three railways. Southward from Strathcona, railway connexion is already made at Calgary with the main line of the Canadian Pacific railway and projected lines eastward to Winnipeg. To the west, two transcontinental roads are being built, also a short spur line runs northward, at present only to Morinville, but shortly either it or a new one will be continued to the Athabaska river.

Commercial Possibilities.

The location of the capital of the Province, at Edmonton, at once raised the importance of the city commercially, Surrounded as it is by fertile agricultural land which is fast filling up with settlers, only a short time will elapse before manufacturing industries will be seeking its advantages. Already its milling and lumber trade have become important, and a meat packing establishment of large proportions is in operation. The presence of fuel that can be mined in the immediate vicinity is an inducement for the permanent location of other manufacturing ventures.

GENERAL GEOLOGY.

As the rocks associated with the coals at Edmonton all belong to the one formation, a brief description only is necessary.

Edmonton Formation.

The Edmonton formation is a series of shales and sandstones, often merely clays and sands, which were deposited during the brackish water period which succeeded the marine invasion of the central part of the continent during Cretaceous times. These deposits were formed while the surface was not elevated much above sea-level. The underlying deposits are mainly shales containing the remains of salt water shells. The overlying deposits form a thick series of sandstones without marine fossils, but with abundant impressions of leaves of land plants and a few shells, evidently of fresh water origin.

The brackish water formation between these two—the salt water below and fresh water deposit above—is found to be very rich in coal seams, denoting an abundant vegetable growth during its period of low altitude and possibly mild climate. The formation is classed with the undoubted Cretaceous beds below and represents the upper member of this series.

Fossil Remains.

The faunal remains so far found do not represent a very wide range, but among the brackish water forms the following have been recognized: *Ostrea glabra, Uno danæ, Corbicula occidentalis, Panopœa simulatrix, Panopœa curta.*

Land or wading animals are represented by a few bones of dinosaurs. Of the plants which formed the coal little is known save that the leaves of plants, found in the adjacent beds, represent the early forms of plants which continued through Tertiary times. Forms recognized or described are: *Abietites tyrrellii, Sequoia reichenbachii, Platanus newberryana, Taxodium occidentale, Taxites olriki, Lemna scutata, Platanus nobilis, Castanea* Sp., *Sapindus affinis, Aesculus antiqua, Trapa borealis,* and *Trapa microphylla.*

Character of Beds.

The top of the formation is distinctly a zone of coal-bearing beds, which increase in value from their southern exposures until at the crossing of the Saskatchewan and Pembina rivers the economic coal

beds reach a thickness of 25 feet, constituting one seam or divided by a small parting into two nearly equal seams. The sandstones of the overlying formation are perhaps more compact than those in the upper part of the Edmonton, but a zone in the latter formation is characterized by the distinctly yellowish colour of its sandstones, a feature characteristic of the upper formation. In the central portion of the Edmonton, whitish clays and sandstones are the characteristic rocks, and since a second coal-bearing horizon is here again in evidence it is unfortunate that mining in this horizon should have to be carried out in such very soft rocks. The lower portion is not well defined, since the shale bands gradually increase in thickness in going downward and merge gradually into the shale formation below.

A thickness of 700 feet is calculated by Mr. Tyrrell as the maximum thickness of the formation. Annual Report, Geological Survey, 1886, Vol. 2, p. 131 E.

ECONOMIC GEOLOGY.

The rocks of the Edmonton district, consisting mainly of clays and sands, are of economic importance on account of the accompanying beds of coal with which they are associated. The possible value of the marls and clays for the manufacture of cement, or the possibility of fine clays being associated with these coal beds, might be also mentioned. The clays have for some time been utilized in the manufacture of bricks for building, but tests should be made of their heat resisting properties. Gold, which has for many years been washed from the bars of the river both above and below Edmonton, is thought to have been derived from the rocks of the upper members of the formation by the concentration of minute particles during the erosion of the river channel.

Gravel dredged from the bed of the river is used extensively for road making. It is washed and crushed at a plant near the low level bridge, and in the operation a small amount of gold is daily recovered.

Coal Horizons.

TERTIARY SEAMS.

In the sandstones lying above the upper Cretaceous or Edmonton formation a few isolated exposures of coal have been found, but as

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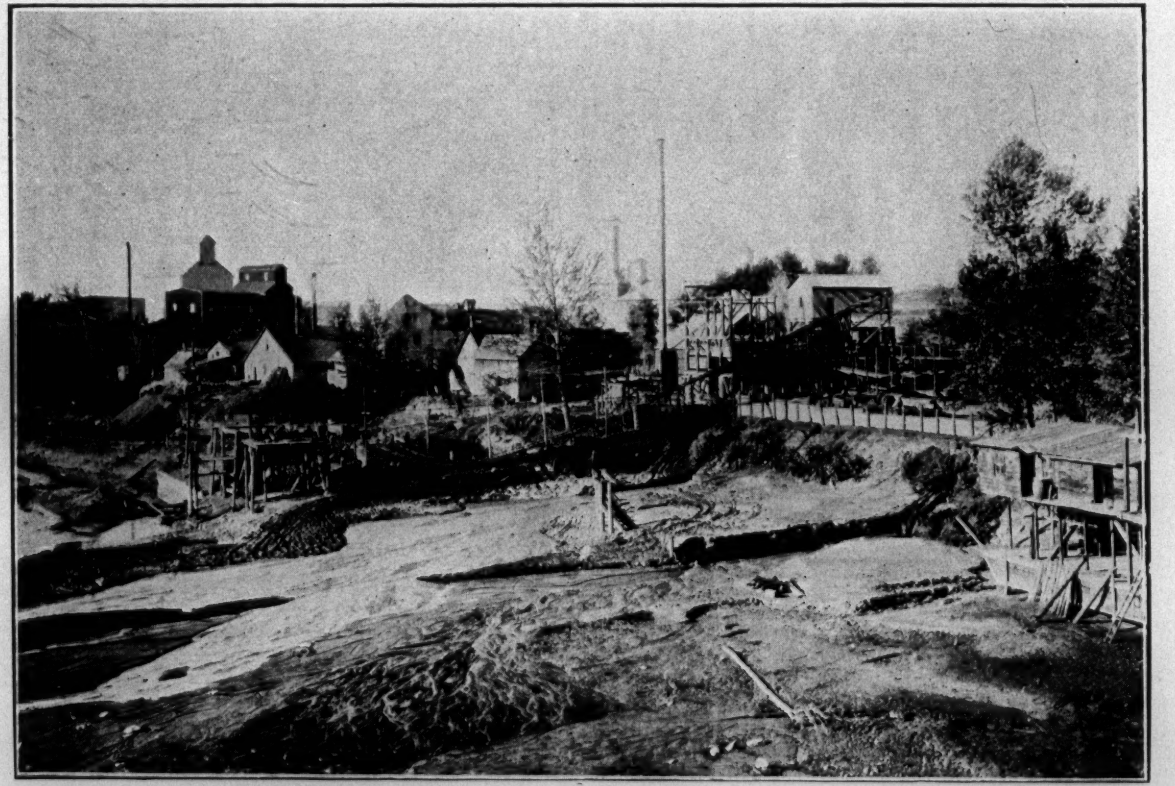


Gravel Washing-plant at Edmonton.

these deposits appear to be local, only brief mention will be made of them.

Coal Near Hobbema.

Rocks of the sandstones series above the Edmonton formation occur at Hobbema. It is, therefore, underlain by coal seams at some depth, but near the surface small local pockets of coal have been found. The following information concerning these beds has been generously supplied by Mr. McKelvey of Ponoka.

On the Ermine Skin Reserve, at the school building west of the station in a well 30 feet deep, a seam of coal 15 feet thick was reached; and by drilling in the neighbourhood another seam was found at 250 feet depth. East of the railway, the drilling of several holes failed to locate the upper seam, which presumably had been removed by erosion, the consequent depression being filled to the general level, by glacial till. It was found again at a depth of 30 feet on sections 10 or 15, township 45, range 24, with a thickness of 8 feet of coal. In the northern part of section 3, same township, 12 feet of coal has been found at the same depth below the surface. Eastward, this seam has been traced by wells to near the Battle river, but is reported as thinning to 6 feet.

East of Ponoka.

It is reported that fifteen miles east along the correction line, at the base of a small hill, a seam of over 2 feet has been discovered.

Near Lacombe.

On section 17, township 41, range 26, west of 4th meridian, a well on Mr. Henry's farm is reported to have pierced a coal seam at 90 feet below the surface. The thickness of coal is given as 7 feet.

West of Red Deer.

In this district small seams of very little economic value are reported. On Blindman river a well on SW ¼ section 10, township 43, range 2, west of 5th meridian, revealed a small coal seam. On Pigeon creek, near its mouth on Battle river, a small seam outcrops on the bank of the stream; also from near Bluff Centre on the Blindman river reports come of a small seam of coal found near the top of the bank. These exposures of coal all belong to the Tertiary and are in rocks that are distinctly of fresh water forma-

tion. Although several seams near Hobbema appear worth mining the coals as a rule in this formation will hardly become of great importance.

CRETACEOUS COALS.

In the 700 feet which the formation, here to be discussed (Edmonton), averages in thickness, coal seams are found to occur in almost every part, but persistent seams may be looked for at the top and middle portions only. The upper series of coal seams at the top of the formation may be referred to as the Pembina or Big Seam horizon. The middle series will be referred to as the Clover Bar horizon since it is best exposed near Clover Bar and Edmonton.

Pembina or Big Seam Horizon.

GENERAL NOTE.

Exclusive of the disturbed area bordering the foothills, exposures of the seams of the upper part of this formation occur or may be looked for in the vicinity of the following places:—

On the Athabaska river above old Fort Assiniboine.

On the Pembina river near the crossing of the Grand Trunk Pacific railway.

Near Wabamun lake.

In the valley of the Saskatchewan river near Goose encampment.

East of Wetaskiwin in the vicinity of the Battle river.

The vicinity of Buffalo lake and thence south to the Red Deer river.

RED DEER RIVER.

Southward, this coal horizon crosses several of the western branches of the Red Deer river and has been proved on the Ghostpine, Threehill, and Kneehill creeks. Its southern continuation crosses the Bow river east of Gleichen. From thick seams at the Pembina river at the northern end of this course the coal gradually lessens in amount as it is followed southerly, thus, from seams 25 feet thick at the north end it decreases to an average of 5 or 6 feet at the south. This change in the amount of coal is possibly due to the thickening of the seams in a westerly direction rather than in a northern, that is to say: this seam prior to its removal by denudation probably was

not more than half as thick at Edmonton as is found in the exposures at the Pembina. Locally, however, all the seams vary greatly in thickness over small areas.

SEAMS AT PEMBINA RIVER.

Details of thickness and character, Pembina Crossing.—These outcrops have been known for many years and are mentioned by Milton and Cheadle in 1863. An examination was made in 1905 by Mr. J. F. E. Johnston for the Geological Survey, and the following details are extracted from his notes: 'The coal deposits on the banks of the Pembina river are situated near the dividing line between townships 53 and 54. The first exposure is on the west bank of the stream and crosses the dividing township line just north of the wagon road. It dips to the west and where measured was 12 feet in thickness. Above this, another seam shows in three places about 30 feet above the one above noted, which is on the edge of the stream. Only 9 feet of the upper seam shows at the surface and has been partially burnt.'

'The thickest coal exposure lies up stream on the east bank from those just noted and starts about 150 yards above the road crossing, continuing for nearly half a mile. It apparently thickens in that direction, as at the end of the exposure, or near it, a maximum thickness of 26 feet was measured. The bottom of the coal is there 3 feet above low water, but it then dips rapidly to the south and into the water of the stream. A small clay bone occurs 6 feet above the bottom of the coal. This would appear to be a seam above the one noted on the west bank at the water's edge and may possibly be the one of which 9 feet only were seen. The continuation of the lower seam occurs a short distance above the road crossing on the east side and measured only 8 feet. The coal is bright and clean and though, of course, it slacks somewhat, firm coal is found at a few inches in from the surface.'

'Below the trail crossing, the lower seam is exposed on the eastern bank for some distance down stream. At about half a mile or near the centre of section 3, a 7 ft. seam is exposed 12 feet above the water. This includes a bone near the bottom of from 6 to 12 inches. This seam is again recognized on the east bank about the centre of section 10, at 30 feet above the stream, with the same thickness of

7 feet, while above it at 15 feet, the thick seam noted above the trail crossing here appears to have only 10 feet of coal. On the opposite bank, near the north end of section 3 at 22 feet above the water, the 7 ft. seam appears to be about 10 feet thick, below it; a 4 ft. seam was also seen.'

There appear, from the above notes, to be three seams exposed. An upper one 26 feet thick at its southern exposure, with 9 feet, possibly representing only part of the seam, exposed in the west bank just below the trail crossing; a lower one, exposed on both banks at the trail crossing, showing 12 feet on the western side and 7 on the east, which continues down the river for over a mile, where 10 feet are exposed on the western shore and 7 feet on the eastern; and a smaller seam beneath the other two which is estimated at only 4 feet.

Analyses of the coals at the trail crossing were made from specimens collected by Mr. Theo. Denis of the Mines Branch, with the following results. Extract from Summary Report, 1906, p. 169.

'No. 1 was taken across the outcrop of the thirteen foot seam above the burnt shale outcrop on the east bank of the Pembina river, about four hundred yards above the crossing of the river; SE ¼ section 33, township 53, range 7, west of the 5th initial meridian, Alberta.

'No. 2 was taken across the outcrop of the thirteen foot seam nearest to the crossing of the Pembina river, on the east bank of that stream; NE ¼ section 33, township 53, range 7, west of the 5th initial meridian, Alberta.

'No. 3 was taken across the outcrop of the six foot seam, on the west bank of the Pembina river, at the crossing, NE ¼ section 33, township 53, range 7, west of the 5th initial meridian, Alberta.

'Analyses by fast coking of the foregoing, by Mr. F. G. Wait, gave as follows:—

	No. 1.	No. 2.	No. 3.
Hygroscopic water	12·93	13·78	13·07
Volatile combustible	31·96	32·01	32·03
Fixed carbon	45·11	47·35	47·56
Ash	10·00	6·86	7·34
	100·00	100·00	100·00
Coke per cent	55·11	54·21	54·90

'They all yield by fast coking a non-coherent coke. The ash had in each instance a light reddish brown colour.'

From the foregoing notes it is seen that the exposures have been eroded so that different measurements result, but there is undoubtedly a thick seam of lignite underlying a large portion of this vicinity. Reports of borings at the west end of Wabamun lake in section 17, township 53, range 5, west of 5th meridian, give 12 feet of coal at 18 feet below level of lake.

SEAMS AT SASKATCHEWAN RIVER.

The horizon of the Pembina seam at the crossing of the Saskatchewan shows at least one heavy seam, known for many years as the Big Seam. This is best exposed at the big arch in section 29, township 50, range 3, west of 5th meridian, where 25 feet of coal shows in the bank. An illustration from a photograph in Mr. Tyrrell's report shows this exposure as it appeared in 1886. The exposure forms a small anticline crossing the valley and has been referred to as 'the Arch.'

On sections 14 and 15, of township 40, range 4, west of 5th meridian, about six miles up the river from the Arch, a heavy bed—possibly the same coal as at the Arch—is divided into three seams by small partings, giving a thickness of coal of 22 to 24 feet. The exposure of this big seam has been visited several times and samples taken for analyses, all giving about the same general result though differing somewhat in ash or moisture. An average of the following four analyses should indicate the character of the outcrop samples:—

Moisture.	Volatile.	Fixed Carbon.	Ash.
11·81	35·58	49·40	2·21
10·90	36·22	47·84	5·04
12·93	34·12	44·95	8·00
14·78	30·48	48·67	6·07

A possible continuation of this seam to the east is on section 12, township 51, range 3, west of 5th meridian, where 15 feet are exposed on the right bank. These exposures, with the ones at Pembina river, indicate an extensive and very rich field in this vicinity that will be mined first along the railway lines running west from Edmonton. Smaller seams underlying this horizon and between this and the Clover Bar coal show as a 4 ft. seam 50 feet above the river in township 50, range 1, west of the 5th meridian. Another of 7 feet, 10 feet above the river on section 36, township 50, range 27,

west of 4th meridian, and a 4 ft. seam, 100 feet above the river on section 31, township 50, range 26, west of 4th meridian.

The continuation of this horizon southeastward for a long distance is not prospected, but crosses the Calgary and Edmonton branch of the Canadian Pacific railway near Millet.

WETASKIWIN.

The log of the gas well at this stage shows an 8 ft. coal seam at a depth of 413 feet. As the measures generally dip to the southwest the outcrop of this horizon should be east of the town. The valley of Battle river, although not showing good exposures of the rocks just to the east of the town, is possibly eroded to near this horizon. An extension northward is filled by a long narrow lake called on the map 'Coal lake,' suggesting that some seams had been found there. Authentic exposures near the town of Camrose prove the existence of the coal.

CAMROSE.

About a mile southwest of the town on the west side of a coulée, at what is known as the *Bowers mine,* probably on section 33, township 46, range 20, west of 4th meridian, a tunnel is run under the bank for about 300 feet. The cover here is estimated at 80 feet. The seam is 4 feet of coal with 1 foot of bone and dirty coal above it.

In the town a well driller stated that several seams had been penetrated, one as thick as 10 feet. The drill was then at 300 feet depth and had just gone through a 4 ft. seam, and reached another at that depth. These latter belong possibly to the Clover Bar upper seams.

North of the town on section 18, township 48, range 19, west of 4th meridian, just beneath the boulder clay, a farmer, George Rakowski, was taking out coal from a 5 ft. seam. This is on a slight elevation, so that the coal may not extend very far in any direction. The cover of boulder clay is about 13 feet. The upper surface of the coal was smoothed by glacial action. In one part of this mine the roof was clay, probably the original cover, with the coal beneath of the following section:—

Bony coal	0′–4″
Clean coal	2′–2″

Bone	0′–2″
Clay	0′–1″
Solid coal	2′–6″

The centre bone and clay is picked out and the upper and lower coal pried out, so that large pieces are obtained without much waste.

Specimens from the Camrose mines were taken and the following results are obtained by Mr. F. G. Wait, chemist:—

	Rakowski Mine.	Bowers Mine.
Moisture	11·78	8·32
Volatile combustible	38·71	42·13
Fixed carbon	46·20	45·80
Ash	3·31	3·75
	100·00	100·00
Coke, non-coherent	49·51	49·55

Both these coals are very clean and should be excellent fuels for domestic and power use.

NEAR RED DEER RIVER.

The continuation of this horizon south crosses the railway east from Lacombe, between Alix and Nevis. At the latter place a 4 ft. seam is being mined, and on the banks of the Red Deer river to the west several seams outcrop and are being mined from the country bank. The following is the description of the exposures by Mr. J. B. Tyrrell, as seen in 1885, and published in Annual Report, Vol. II, 1886, p. 60E: 'For twenty-one miles below the mouth of Blindman river, the Red Deer flows in a deep valley with beautiful alluvial intervals, the sides gradually becoming lower and more sloping, but they are occasionally scarped and then show coarse-grained sandstone, and light-coloured sandy shale, dipping slightly towards the west. About the middle of range 24 a seam of coal is seen cropping out at the water's edge, overlain by a bed of soft, coarse-grained, light-coloured sandstone, in which some silicified wood is included. A quarter of a mile farther down the river, the same seam is seen, showing the following section:—

Coal	5′–0½″
Carbonaceous sandstone	0′–4″
Carbonaceous shale	1′–7″

Coal	1′– 3″
Shale	0′–10″
Coal	2′– 0″
Shale	0′– 2″
Coal	1′– 4″
Clay	0′– 0″
Coal	0′– 6″
Clay	1′– 1″
Total	13′– 3½″
Total coal	10′– 1½″

'This seam occupies the same geological position as the Big Coal Seam on the Saskatchewan river farther north, namely, the top of the clay and sandstones of the Edmonton subdivision of the Laramie, and it is not improbable that it is a continuation of the same seam. The seam is underlain by a soft coarse-grained sandstone containing an irregular seam of clay-ironstone one foot thick; and all the way to the mouth of Tail creek, a distance of eighteen miles, similar sandstones with a light dip westward, crop out at the outer side of the curves of the river. The banks are generally grassy or wooded and the above-mentioned coal seam gradually rises to the top of the bank, its presence being indicated, in many places, by red ashes and cinders, while other seams, of very small thickness, are exposed under it.'

Mining has been done on this seam for several winters, but much of it has been only from the face of the bank, and in a small way.

On the western edge of township 23, on the north bank, a Mr. Conger has been mining from the face of the bank, and on the opposite side Mr. Russell is taking out the lower part, leaving coal for roof. The section here is reported to average:—

Coal	4′–0″
Shale	1′–6″
Coal	1′–6″
Shale	1′–0″
Coal	1′–0″
Shale	1′–6″
Coal	0′–9″

Farther down the river on section 34, township 38, range 23, there is 15 feet of clay above the seam, and below it three streaks of coal with clay partings that might make a fair roof above a 4 ft. coal seam. Below this there are three thin coal seams as in the section above. The 4 ft. seam is fair lignite with the following composition:—

Moisture	14·44
Volatile	35·42
Fixed carbon	34·85
Ash	8·43

The lower bench is a much softer coal and is called there blacksmiths coal, but it is a poor lignite of the following composition:—

Moisture	10·01
Volatile	42·39
Fixed carbon	34·85
Ash	12·75
	100·00

On the east side of Tail creek, in a small gully from the east, a 4 ft. seam is being mined on section 11. This is near the Lacombe branch of the Canadian Pacific railway, and a siding has been put in for shipping coal. Ben Nevis is the name of the mine and it is operated by Turnbull and Cousins. The seam has a clay parting in the centre which is mined out and the two benches pried out, leaving the coal in large pieces. The roof is a sandstone that stands up well and needs very little timbering. The upper bench is 23 inches coal. The parting averages 6 inches clay. The lower bench is 22 inches coal. Several analyses have been made of this coal; one supplied by Mr. Cousins appears to be air-dried, but has:—

Moisture	7·00
Volatile matter	36·00
Fixed carbon	49·00
Ash	8·00
	100·00

The sample analysed in the Department gave:—

Moisture	11·40
Volatile	33·92
Fixed carbon	44·95
Ash	9·73
	100·00

The seam, although nearly level, pitches slightly to the northeast, and under the railway track has 78 feet of cover. The mining is done from the coulée by level entries and the mine cars hauled up an outside slope to the tipple.

THREEHILL CREEK.

The continuation of this coal horizon has been tested southward along the west slope of the Red Deer valley and is mined at the crossing of Ghostpine creek and Threehills creek, as well as on Kneehill creek.

At Threehill creek there are two mines. The one first opened, by level entry from the bank of the river, is on section 22, township 31, range 24, west of 4th meridian. The seam outcrops below this point and there are several old workings. The present one, nearer the trail on the south side, has a short slope continued up to a tipple which discharges into wagons. The haulage at the mine is by hand to the slope, then by horses. There is a very fair sand roof, almost a sandstone, beneath which a 2 inch coal seam lies on a foot of soapy clay. This is easily mined away and the lower bench 3 feet 8 inch coal pried up. This comes up without much waste. The coal is of good appearance and by analysis shows:—

Moisture	7·70
Volatile	35·36
Fixed carbon	48·60
Ash	8·34
	100·00
Coke, non-coherent	56·94

Analysis by Mr. F. G. Wait.

A second mine has been opened to the east of this on section 26, township 31, range 24, west of 4th meridian. This coal is reached

by two shafts in which the cage is raised by horse-power. The cars carry only one-third of a ton and are lifted 75 feet to the surface. This seam may possibly be the same as at the first mine, but appears to be at a higher level.

The coal, a 5 ft. seam, has a sandstone roof that is very soft, so 6 inches of coal is left for a roof and 4 feet 6 inches taken out. There is a parting of 1 or 2 inches of clay at about the centre. The miners here say that it is difficult to take out this coal owing to there being no cross fractures, and it has to be fired. This breaks up the coal and damages the roof. There is more waste from small coal here than at the Threehills mine.

Analysis of the coal shows it to be of about the same grade as the last. The following is Mr. Wait's analysis for the average of the seam:—

Moisture	8·08
Volatile	34·94
Fixed carbon	47·60
Ash	9·38
	100·00
Coke, non-coherent	56·98

MINES ON KNEEHILL CREEK NEAR CARBON P. O.

Kneehill Coal Mine.—The entry is in the face of the bank on the south side of the creek, about 15 feet above the river flat. The seam is overlaid by a thick bed of sandstone that makes a good roof, not very hard but holds well. Seam 4 feet 3 inches. Two inches at the top is mined and the coal shot from the bottom. Analyses of coal by G. C. Hoffmann:—

Moisture	13·28
Volatile	36·69
Fixed carbon	43·84
Ash	6·19
	100·00

Just below this mine, on section 13, township 29, range 23, west of 4th meridian, another opening known as Dodds mine is on the same seam and is reported to be of the same character.

On section 6, township 29, range 22, west of 4th meridian, is Hedstroms mine, and north of it on section 19, township 29, range 22, west of 4th meridian, the Carbon Brick and Coal Company has an opening on this seam. Reports give the thickness of coal there as slightly greater than at the others, the seam in some places being 5 feet thick.

The southward continuation of this horizon crosses the Canadian Pacific main line near Gleichen.

Seams Between Pembina and Clover Bar Horizons.

No persistent horizon can as yet be made out between the top and middle of the formation, and such occurrences as appear to belong to this division may all be different seams. Those occurring near Edmonton will be discussed with the seams of that place.

BIG ISLAND.

On the Saskatchewan, at Big island, the Wetaskiwin Coal Company is operating on a 5 ft. seam at the Black Diamond mine. This property is on NW ¼ of section 20, township 51, range 21, west of 4th meridian, and on section 28 of the same township. Analysis of the coal as supplied by Mr. F. B. Smith, shows:—

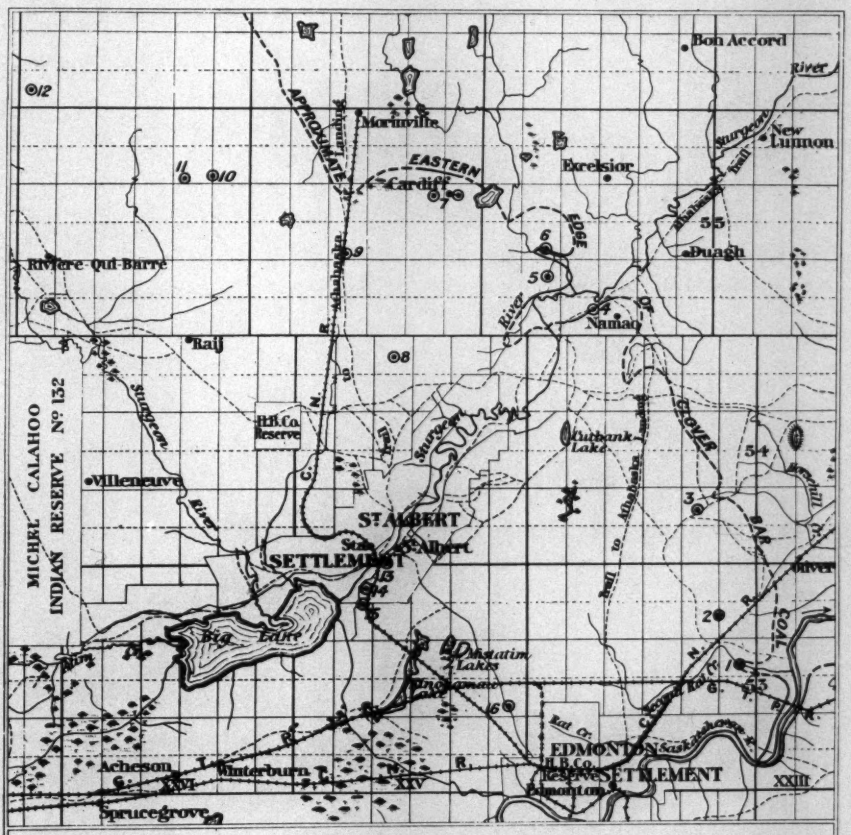
Moisture	14·00
Volatile matter	34·70
Fixed carbon	44·60
Ash	6·70
	100·00

The Big Island coal mine of this vicinity was operated by M. R. Holloway, but has been closed since 1899.

WHITE STAR MINE.

East of this three miles, on Whitemud creek, a seam that might easily be the same as the Big Island one, is mined at the White Star mine. The property is under lease from the Canadian Pacific Railway Company, and consists of the west half and NE ¼ section 25, township 51, range 25, west of 4th meridian. In the mine a small parting in the seam is reported as increasing in thickness to the north and east. There is about 5 feet of coal, though in places this increases to 5 feet 8 inches. The lower bench, about 2 feet 6 inches, is said to be the best coal. The thickest parting seen

FIG.1.



RECORD OF BORINGS

Nº of ⊙	Depth	Seam		Nº of ⊙	Depth	Seam		Nº of ⊙	Depth	Seam		Nº of ⊙	Depth	Seam	
	Feet	Feet	Inch.		Feet	Feet	Inch.		Feet	Feet	Inch.		Feet	Feet	Inch.
1	100	—		5	75	4	10	9	45	12	0	13	268	7	0
2	—	4	6	6	Outcrops	4	6	10	130	17	5	14	229	7	0
3	30	6	0	7	20 to 45	10 to 15 Feet.		11	150	19	0	15	261	7	0
4	Outcrop	5	0	8	150	Not reached		12	210	Top of Seam		16	240	5	0

To accompany Reports Nos. 1113 and 1114 (Edmonton).

Borings shown thus: ⊙

Borings or Test Holes
to the
CLOVER BAR COAL HORIZON
NORTHWEST OF EDMONTON
ALBERTA

Scale

Miles 5 4 3 2 1 0 5 Miles

in the mine was 2 inches of soft clay. The mine is reached by a short slope and the coal is screened. The cleanest part of the lower bench is certainly good fuel. The sample from within the mine contained:—

Moisture	16·75
Volatile	35·17
Fixed carbon	45·09
Ash	2·99
	100·00

In places this coal shows a streaked appearance, and two samples of this were chosen for which Mr. Wait also furnishes analyses:—

Moisture	16·40	15·95
Volatile	37·04	35·41
Fixed carbon	40·88	41·82
Ash	5·68	6·82
	100·00	100·00

Mr. F. B. Smith, from a commercial sample obtained the following results, which are, as will be seen by comparison, a fair average for the coal:—

Moisture	15·00
Volatile	37·00
Fixed carbon	43·00
Ash	5·00
	100·00

This mine is in active competition with those in Strathcona, although the coal is required to be hauled by team to the town.

West of Edmonton some of these seams have been reached by drill holes; thus on section 23, township 55, range 26, a 4 ft. seam was passed through at 83 feet, and the Morinville seam at 130 feet. Again, on section 5, township 55, range 27, west of 4th meridian, on the upper part of Sturgeon river, a seam of 6 feet is reported in the bank. To these should be added many small finds of coal near the surface, as well as seams in the immediate vicinity of Edmonton, which are discussed in connexion with a diagram showing the sections as given by bore holes and mining shafts in that vicinity.

Clover Bar Coals.

GENERAL NOTE.

The middle of the formation at Edmonton is marked by a series of coal seams, the upper ones of which appear to extend over very short distances. Two have been traced over longer distances than the others and appear to be fairly constant, but are not always reliable as workable seams. The outcrop of one near Clover Bar can be traced through the city, and although here quite uniform, northward it decreases to 2 feet and then increases to 15 feet in thickness. The coals of this horizon are found from near Egg lake by way of Morinville and Namao to Clover Bar. Near the south end of Beaver lake a seam occurring at approximately this horizon is found, and another on the Battle river. At about the same horizon one is found on the Red Deer river at the mouth of the Rosebud. These are possibly all on the same horizon, and are characterized by having soft rocks both above and below.

Lower seams than those outcropping at Edmonton are found by boring, and it is possible that isolated exposures of these are found east of the outcrop of the Edmonton seams.

One fairly persistent coal horizon, sometimes represented by two seams, underlies this town. It can be traced by bore holes to the northwest, and although not always of mineable thickness is fairly constant as a distinct coal seam. Its outcrop is on the bank of the river east of the town and dipping up stream passes under the water of the river at the boundary between ranges 23 and 24. Between this point and the Grand Trunk Pacific bridge it rises to 30 feet above the water and is mined at several points on each side of the valley. Its outcrop northwestward is concealed by varying thicknesses of drift material and is, therefore, difficult to trace, since the rock surface is not always indicated by the contour of the present prairie. The following notes relative to the depths below surface and thickness of this seam northwest were gleaned from various sources, principally from Mr. F. B. Smith.

(1) In the centre of the valley of Second Rat creek on section 24, township 53, range 24, just north of the Grand Trunk Pacific, a shaft was sunk in expectation of finding the seam at about 100 feet. There evidently had been an old channel here eroded which re-

moved the most of this coal in the vicinity of the shaft. The section obtained was:—

Soil and surface deposit	85′–0″
Quicksand	20′–0″
Float coal, loose pieces	....
Shales	91′–0″
Shaly coal	3′–0″
Sandstone and shale	27′–0″
Coal	3′–6″

A seam over 100 feet below the Clover Bar seam is revealed in this shaft.

(2) A mile to the northwest on NE ¼ section 26, and west of the Canadian Northern railway, a seam 4 feet 6 inches in thickness is reported, but the depth was not stated.

(3) On section 11, township 54, range 24, the Ruperts Land Coal Company has put down a shaft 30 feet to a 6 ft. seam. The rocks passed through according to Mr. Smith were:—

Alluvial clay	10′–0″
Hard clay shale	2′–0″
Coal (probably shaly)	8′–0″
Clay shale	6′–6″
Hard clay shale	1′–6″
Coal	6′–0″

Analysis of this coal by Mr. F. B. Smith:—

Moisture	17·28
Volatile	35·68
Fixed carbon	39·74
Ash	7·30
	100·00

Negative results were obtained from a bore hole on section 26, township 54, range 24, two miles north of the Ruperts Land Coal Company's property, so that the seam must reach the surface deposit between the two places. Bore hole 200 feet without coal.

(4) In the valley of the Sturgeon river near Namao, a 5 ft. seam is mined from the outcrop. The first opening near this place is that of the Namao Coal Company on west ½ section 3, township 55, range 24. They have, by report of Mr. Fraser, Inspector of Mines, 5 feet

of coal separated by 2 feet of bone, and the roof is soft. The coal is of a good quality of lignite, from the analyses by Mr. F. B. Smith, two of which are here quoted:—

Moisture	13·0	15·8
Volatile	38·8	38·7
Fixed carbon	42·7	42·2
Ash	6·5	3·3
	100·0	100·0

On the adjoining section to the west the coal is 4 feet 6 inches and has many partings. The seam has not been traced up the valley, but on the opposite side is being mined on sections 8, 9, 16, and 17, in the same township.

(5) On section 9, there is 4 to 5 feet of coal with a bone parting from 2 to 6 inches in centre. Mined by Lindsay Bros.

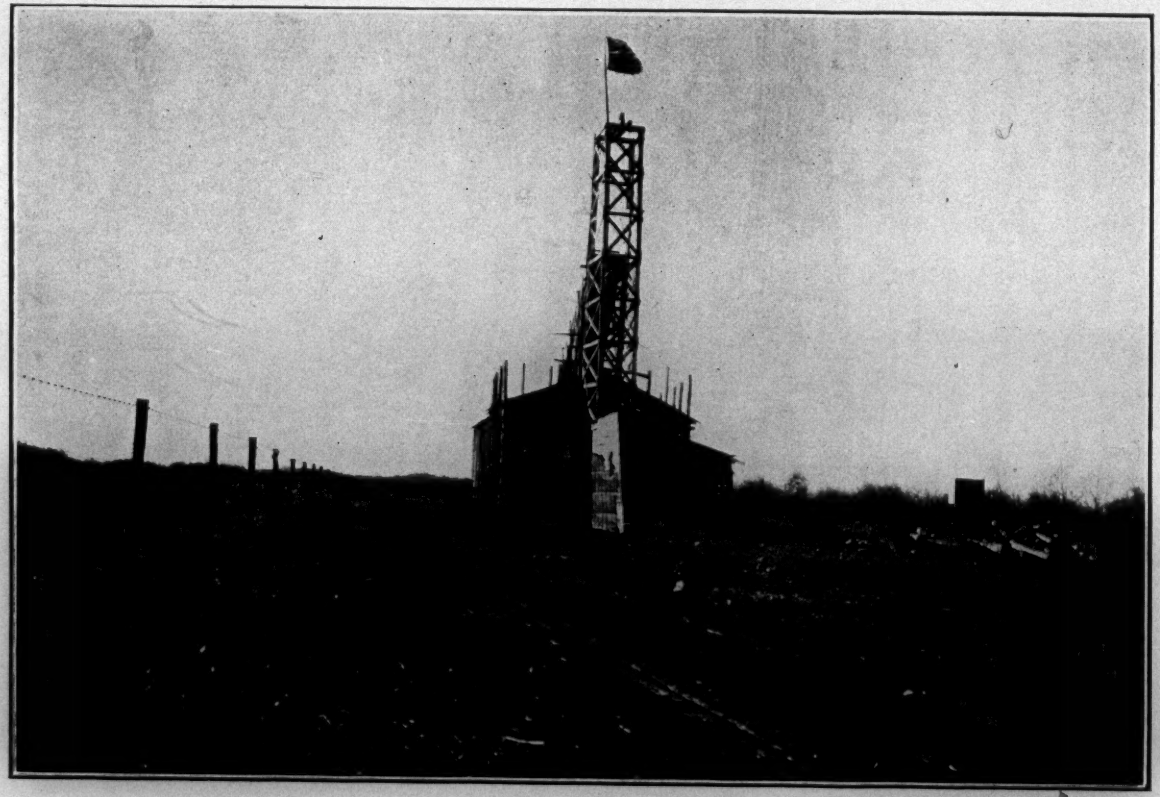
Section 8. On the southeast quarter, Curwen and Kelly have opened a drift from the Sturgeon valley on a 4 foot 10 inch seam. The cover over this seam in the centre of the section is about 75 feet, and a 3 ft. seam 50 feet above has been discovered. On the northern part of the section a shaft 60 feet is down to a 6 ft. seam, which thickens to the northward, but thins again very rapidly at the branch coulée which here runs to the east. The mine with the shaft is called Smith's mine. Analyses of the coal from the south end of the section, an average of the seam, gave:—

Moisture	9·51	17·42
Volatile	39·05	37·02
Fixed carbon	46·78	40·83
Ash	4·66	4·73
	100·00	100·00

(6) SW ¼ section 16, township 55, range 24, seam 4′–6″ thick: mined by Watson Bros., Namao.

Section 17, township 55, range 24, same seam as above (4′–6″): mined by Gibbard and Bontwell; and on a seam 5 feet of rather soft and broken coal, by C. G. Carnegie.

11662—p. 30.



Smith's Mine near Namao.

(7) In the next township to the west (township 55, range 25), sections 23 and 24 are being mined by the Cardiff and Alberta Companies. The seam is between 10 and 15 feet thick with cover from 20 to 45 feet. There is a depression to the north of these properties, and the coal seam as it dips slightly to the southwest probably is denuded from the country a short distance to the north. Its presence has been reported at several places southward with varying thicknesses.

(8) On section 33, township 54, range 25, a bore hole 150 feet did not reach the seam. This is about five miles from the probable outcrop.

(9) South ½ section 16, township 55, range 25, borings show 12 feet coal at 45 feet. One mile north of this near the supposed outcrop, 5 feet of coal is claimed, but the depth below surface was not obtained.

(10) West of Morinville test borings on south ½ section 23, township 55, range 26, proved the seam here to be dipping westward 25 feet to the mile. On the eastern border of this section the cover was 130 feet, and the coal 17 feet 5 inches in thickness.

(11) Near the southwest border of this section the seam was at 150 feet depth with 19 feet thickness.

(12) The most distant boring striking this horizon is that on section 6, township 56, range 26, where the cover was given as 210 feet.

(13) No. 1, near the railway bridge on lot 53, 20 feet above track, 268 feet to 7 feet coal.

(14) No. 2, in centre of lot 54 lower than track, 229 feet to 7 feet coal.

(15) No. 3, close to south edge of lot 54, 261 feet to coal.

(16) Section 13, at the westerly edge of the city limits, a bore hole 240 feet reached coal seam of 5 feet.

The many bore holes in the immediate vicinity of the city of Edmonton are utilized in forming a small plan on which lines are drawn giving depths to the Clover Bar seam.

The wells just enumerated reach the Clover Bar horizon. In the Pittsburgh shaft and boring on section 24, township 53, range 24, a seam was reached at a depth of 226 feet or possibly over 100 feet below the Clover Bar seam. Reports from Legal, a post-office north of Morinville, are to the effect that a 10 ft. seam has been found there. Another seam of probably a lower horizon has been found near Edison on section 24, township 29, range 26, west of 4th meridian. This is in a surface well and the coal is reported as 7 feet thick.

COAL MEASURES AT EDMONTON.

List of bore holes, shafts, etc. Numbers refer to those on plan of Edmonton accompanying this report.

No. 1. Shaft at Strathcona mine.
Top of sill at shaft, coal seam 4½ feet, elevation 2107 feet above bed.
Top of coal seam being mined 5 feet, elevation 2013 feet.

No. 2. Bore hole on same property reaching Clover Bar seam at 1921 feet. Coal 7 feet.

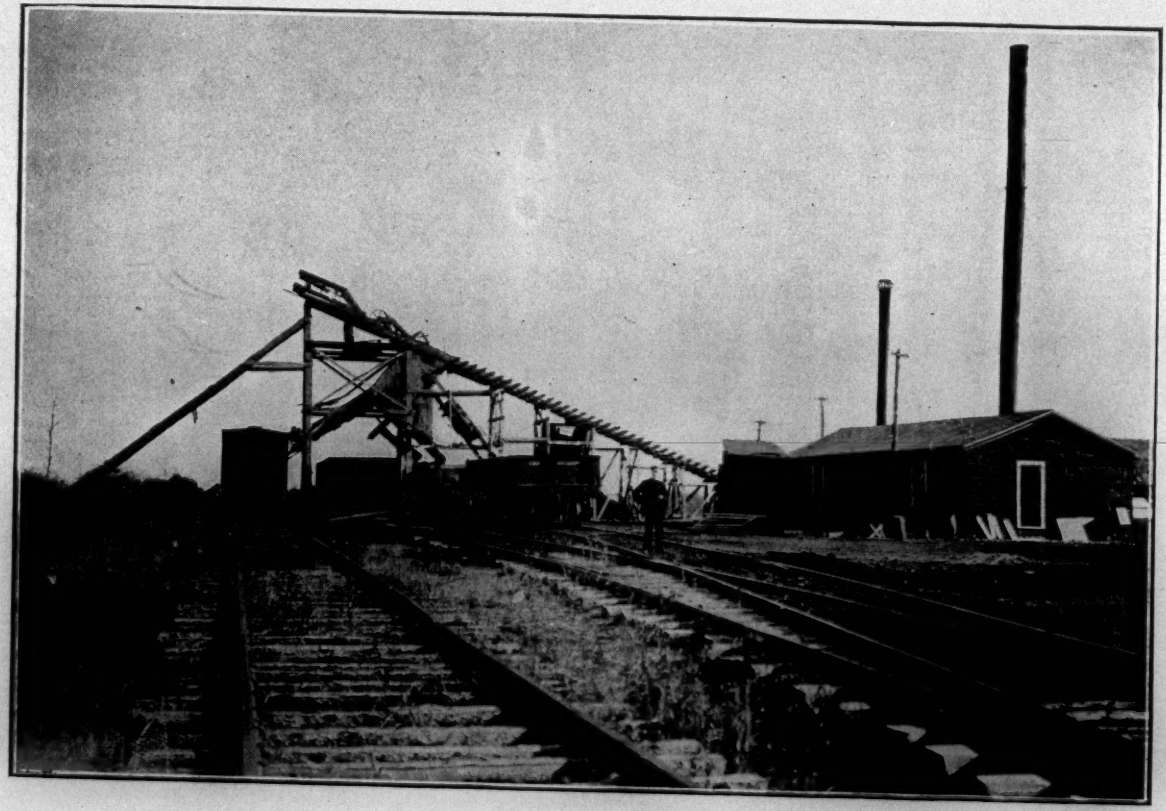
No. 3. Well at City Power Plant near foot of Fourth street.
Ground about 2058 feet above sea.
About 6 feet coal at 1928 feet above sea.
Soft brown coal at 1909 feet above sea.
Coal 6 feet at 1849 feet above sea.

N. 4. Well at foot of First street.
Depth 100 feet, 3 ft. seam of coal.
Depth 200 feet, 6 ft. seam of coal.
Depth 350 feet, 8 ft. seam of coal.

These bore holes, although near together, do not agree very well. The last one is, however, not very reliable since the log was kept for character of the rocks only, which are noted at long intervals.

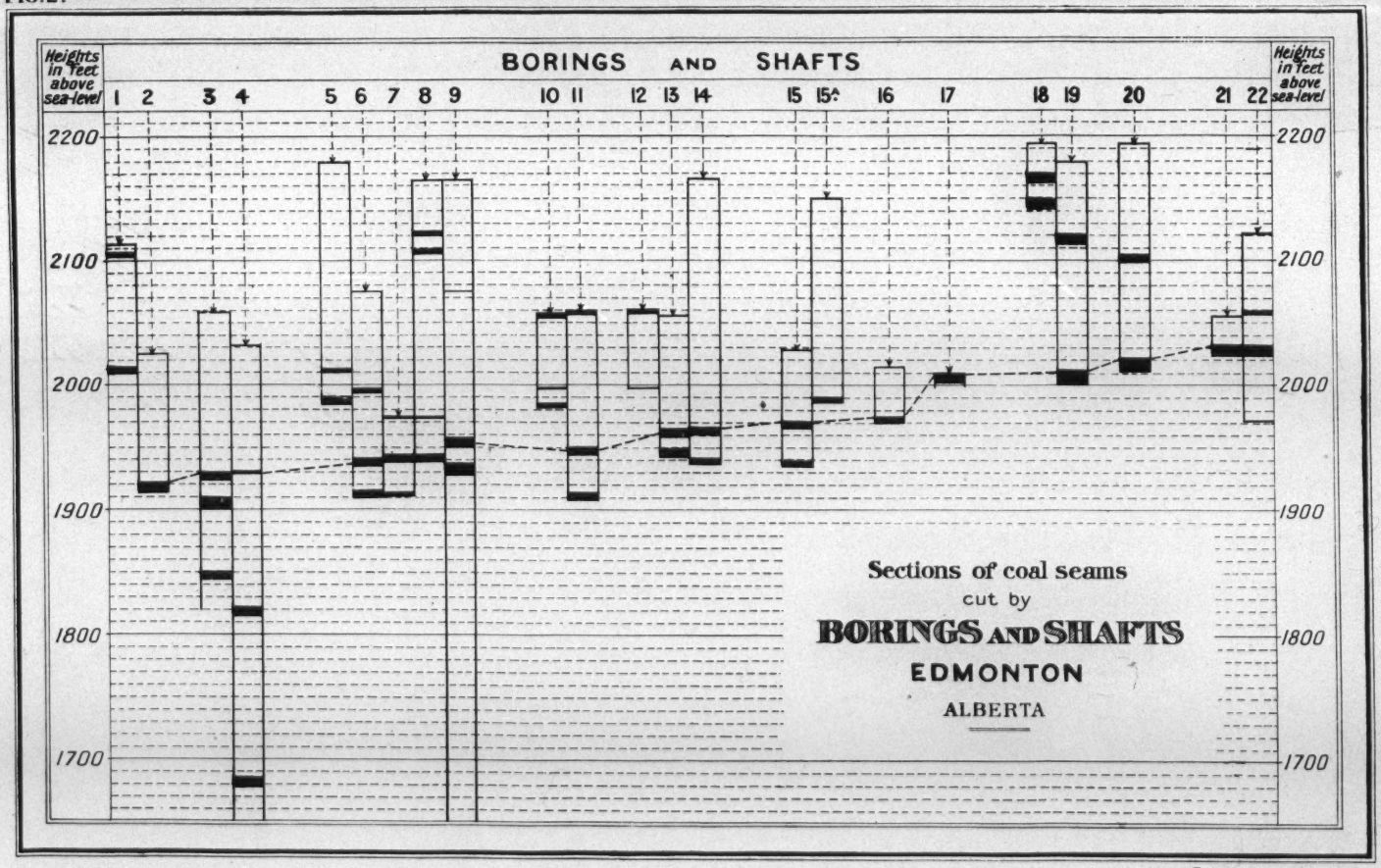
N. 5. Bore hole on the southeast corner Strathcona, near Mill creek.
Ground 2175 feet above sea.
Two feet coal 2011 feet above sea.
Fifty-eight feet coal 1990 feet above sea.

11662—p. 32.



Alberta Coal Mine, near Morinville.

FIG. 2.



To accompany Reports Nos. 1115 and 1116 (Edmonton).

No. 6. Drill hole at shaft, Twin City mine.
Sill of shaft, 2075 feet above sea.
1½ feet coal 2007 feet above sea.
1 foot coal 1997 feet above sea.
1 foot coal 1997 feet above sea.
3 feet coal 1939 feet above sea.
2 feet coal 1935'-6" above sea. } Clover Bar seam.
2 feet coal 1916'-6" above sea.
6 inches coal 1914 feet above sea.
2'-8" coal 1911 feet above sea.

No. 7. Bore hole on Mill creek near river.
Ground about 2019 feet above sea.
2'-6" coal 1975 feet above sea.
7'-5" coal 1945 feet above sea.
Top of coal seam 1913 feet above sea.

No. 8. Cameron mine, river lot 16. The following information is obtained from Mr. J. F. E. Johnstone's notes:—
65 feet below the river the Clover Bar seam was found.
A 3 ft. seam is about 33 feet below the water.
3½ to 4 feet coal at 100 feet above river.
3 feet coal at 115 feet above river.
1½ feet coal at 160 feet above river.

As the bank here is only 160 feet above the river the measurements are over stated, but the lower seams are plotted alongside No. 7.

No. 9 Boring for gas in Edmonton on north side Jasper Avenue, eastern end of town. As this is a deep hole great care was not taken in getting the exact depth at which coal seams were passed. The following coal seams were noted:—
Natural surface about 2165 feet above sea.
A small seam of coal at 2075 feet above sea.
Bottom of an 8 ft. seam at 1950 feet above sea.
Top of a 9 ft. seam at 1942 feet above sea.
Coal said to be 6 ft. seam at 725 feet above sea.
This latter seam at a depth of 1440 feet must be in the Belly River formation.

N. 10. Baldwin mine, river lot 23A.
Seam 2'-8", 57 feet above river.
Seam 1'-6", at level of water.
Seam 3'-0", 15 feet below water.

No. 11. Milner mine, river lot 20, seams 55 feet above river.
United Collieries sank shaft 6 ft. seam, about 50 feet below river, and drilled 30 feet to lower seam with 7 feet coal.

No. 12. River lot 25, a seam of 4 feet crops out 60 feet above river.
At water level on the bank a 2 ft. seam is exposed.

No. 13. Dawson Coal Company.
Shaft 90 feet, to 6 ft. coal seam.
Lower seam between 6 and 7 feet at 107 feet. An upper seam of 4 feet was worked years ago.

No. 14. Parkdale coal mine.
Ground at railway, 2165 feet.
Coal seam 4 to 5 feet, 1965 feet.
Coal seam 4 feet, 1940 feet.

No. 15. Edmonton Standard Coal Company.
Ground at shaft, 2024 feet.
Top of coal 4 to 6 feet, 1970 feet.
Lower seam, 1938 feet.

No. 15A. Bore hole SE ¼ section 14, township 53, range 24, west of 4th meridian.
163 feet to 4′–6″ coal seam.

No. 16. Frank Coal Company. Shaft 40 feet.
Ground about 2015 feet.
Coal 4 feet, 1975 feet.

No. 17. Exposure of the Clover Bar seam at water level section of seam shows 1′-6″ at top that is left for roof. Then 4 to 6 inches clay is mined. The lower part of the seam, 7 feet to 7′–6″, is clean and hard.

No. 18. Bore on section 5, township 53, range 23.
Depths 35 feet to 7 feet coal.
55 feet to 8 feet coal.
Without leveling to find this place I have assumed that these two seams are near the surface. The ground near this is at 2194 feet, so that the coal seams occur at the following elevations, approximately:—
7 ft. seam is at 2169 feet above sea.
8 ft. seam is at 2149 feet above sea.

No. 19. Bore on northeast corner section 6, township 53, range 23.
Ground about 2180 feet above sea.
Coal 6 feet, 2120 feet above sea.
Coal 9′-6″, 2011 feet above sea.

No. 20. Bore on north part section 5, township 53, range 23, ground slightly higher than above.
Ground 2194 feet above sea.
Coal 6 feet, 2104 feet above sea.
Coal 9′-6″, 2020 feet above sea.

No. 21. Air shaft for Clover Bar mine.
Ground in coulée 2066 feet above sea.
Coal 8 feet, 2031 feet above sea.

No. 22. Borings at Budge, western side.
Rail 2131 feet above sea.
Coal 3 feet, 2059 feet above sea.
Coal 8 feet, 2031 feet above sea.
Coal 1 foot, 1970 feet above sea.

These bore and mining records are very imperfect, but with the aid of a small diagram on which they have been plotted it is quite plain that all the seams above the Clover Bar are not continuous over any extent, even when such seams as those in No. 18 are found. The Strathcona mine seam in No. 1 may possibly be represented in Nos. 5 and 6, but there is no seam above the Clover Bar that can be traced with any certainty. In No. 18 two heavy seams of coal are just beneath the surface. These being near the surface have been eroded from a large part of the valley, and there is some chance that drift blocks such as that on the J. Emery estate, southeast corner of Strathcona, may have been derived from one of these exposures.

Clover Bar Seam.

Thickness and Position.

Underneath the city the Clover Bar seam varies in thickness from 4 feet 6 inches to 8 feet. From its maximum near the Grand Trunk Pacific bridge it decreases to 4 feet 6 inches, although there are places near its outcrop where it is even less. Over the country to the north, where it is supposed that drill holes have tested the continuance of this seam, thicknesses up to 19 feet are reported. Near St. Albert a 7 ft. seam is found in the borings. West of Morinville there appears

to be evidence of a heavy seam ranging from 12 to 19 feet, while at the mines near Morinville this seam is between 10 and 15 feet thick. In the vicinity of Namao it is only about 5 feet.

In speaking of all these occurrences as being the extension of the Clover Bar seam as far west as Morinville, it would be perhaps misleading. This seam might not extend very far; but another seam within a few feet either above or below would continue until replaced by another, and so form the Clover Bar horizon. There may be localities where the seam thins out so as not to be recognized. Bore No. 8 on section 33, township 54, range 25, west of 4th meridian, does not appear to have touched the coal. Either it has thinned out or is at a greater depth. In the exposures along the Saskatchewan there is a fairly constant dip to the seam, up the valley, of about 25 feet to the mile. West of the town there is evidently a greater dip if the boring at the Great Estate is to be taken as reaching the Clover Bar seam at 130 feet. This, however, is quite to be expected in localities, but the increase in dip can hardly continue far as the formation does not go under at that rate. North of Edmonton the bore holes at St. Albert, at a distance of nine miles from the outcrop, give the approximate dip of 25 feet to the mile to the southwest.

As the majority of the mines in the Edmonton district are on the Clover Bar seam, an attempt has been made to show the amount of cover that the seam has over a limited area. The topographical work of the Grand Trunk engineers has facilitated this very much, and from the contour map and the depths given by bore holes, the general depth at any point to this seam is shown by lines very much resembling contour lines, but as they represent lines of equal depth to the coal seam the designation 'isobathic lines' may be used. A special sheet is to be prepared showing these isobathic lines, and on this figures added for the thickness of the seams. Accuracy is, of course, not claimed for portions not near drill or test holes, but it is hoped that the map may serve as a guide to drillers in locating the seams.

CLOVER BAR HORIZON SOUTHEAST.

East of the Saskatchewan the coals of this horizon are not exposed for some distance. Near the south end of Beaver lake a coal seam outcrops through several townships and is of sufficient thickness to mine over a large area. This is probably one of the Edmonton seams.

On the banks of Battle river, below Dried Meat lake and as far east as range 15, several seams which should belong to this horizon also outcrop. As these exposures are not far from three railways it is quite evident that by drilling they may be traced to advantageous positions near these lines, where they can be mined and become available for domestic use on the treeless prairie south and east. Mining is being done by the settlers at the outcrops which are mostly at a distance from the railways.

Bawlf.—In the town of Bawlf, which lies seventeen miles southeast of Camrose, on the Canadian Pacific railway, wells have been drilled to a depth of about 100 feet for water, and a supply obtained apparently from a coal seam which at places has a thickness of 7 feet. Alongside the hotel near the station the drilling penetrated the coal 6 feet 10 inches at a depth of 100 feet. Small samples of the material obtained, although high in ash, need not be assumed as being representative of the seam, since the purer particles were probably ground fine and the harder pieces from which the samples were selected were of a more stony nature. The analysis, by Mr. Wait of the Mines Branch, Department of Mines, shows:—

Moisture	11·60
Volatile combustible	34·96
Fixed carbon	34·53
Ash	18·91
	100·00

In the wells, for the town water-supply, the thickness of the coal seam varies considerably, being reported as 5 feet in one and 2 in another. There are also apparently very shallow places, for in a well drilled on Mr. K. O. Eggan's lot no coal was observed although a depth of 210 feet was reached.

North of the town half a mile on section 6, coal was found in Mr. Spoklie's well at a depth of about 70 feet. The reported thickness was 9 feet. This indicates a local thickening northward and also an upward slope in that direction. It is quite possible that the seam represented under the town is the one that is found 9 feet below the surface on sections 28 and 32, township 46, range 17, about six miles north. It might also be conjectured that the coal from Round hill or the vicinity of the north boundary of township 47, range 18,

comes from the same set of seams. A sample of this coal obtained from a load brought to the town gives the following analysis:—

Moisture	16·23
Volatile combustible	37·16
Fixed carbon	40·86
Ash	5·75
	100·00

The major portion of the fuel supply for the town comes from this locality, and it is reported that the seam lies at a shallow depth below the surface. The thickness was not given.

Coal is being mined on the bank of Battle river in several places. On section 15, township 44, range 19, west of 4th meridian, a small seam underlying the farm of Mr. Potter is opened from the bank.

Potter's Mine.—The entry is from the face of the bank on the north side of the valley. The seam is 3 feet thick, and as the roof is a soft sandstone considerable timbering is necessary. The entry is in about 100 feet and the rooms are on each side. The amount of coal extracted from the entry is small as the openings are allowed to fall in after one or two rooms on each side have been worked out.

The coal is a good class of lignite, Mr. Wait's analysis showing:—

Moisture	14·43
Volatile combustible matter	36·65
Fixed carbon	44·05
Ash	4·87
	100·00

Many of these mines were visited last season by Mr. F. B. Smith and I am fortunate in being able to extract the following information from his notes:—

'*Tofield.*—Two days were spent in this vicinity inspecting the mines of the Tofield Coal Company, and of P. Ingram to the south. The former, situated on NE ¼ section 26, township 50, range 19, west of 4th meridian, is the only mine at present working a few days each week.'

'**Tofield Coal Company.**—The seam mined is 8 feet thick with a cover varying from 17 to 30 feet. This seam crops out on section

35, township 50, range 19, west of 4th meridian, and again in a coulée on section 24, township 50, range 19, west of 4th meridian. To the southeast the coal thickens to 10 feet, but at no point can there be worked any more than 7 feet, since the surface covering is really only glacial clay, the top part of the coal having to be left for a roof.'

'The coal is similar to that mined at Morinville, easily subject to disintegration from weather conditions. It is very high in moisture but low in ash. The analyses is approximately:—

Moisture	22 – 24	per cent.	
Volatile matter	36 – 34	"	"
Fixed carbon	40 – 37	"	"
Ash	2 – 5	"	"
	100 100		

'The mine has been opened for about a year only and very little development work has been done. The Company expect to have railway connexion with the Grand Trunk Pacific, when they intend mining more extensively to supply the growing towns along that line.'

'**Ingram Mine.**—Is on section 24, township 50, range 19, west of 4th meridian, but has not been worked since last winter (March, 1908) and supplied local demand only. The coal here is about 10 feet thick. The mine is very primitive and requires considerable new work to open again. There are indications of coal as far south as township 53, range 18, west of 4th, but there are no mines reported.'

'The coal exposed and worked in the Tofield district seemingly extends fairly well over the northeastern portion of township 50, range 19, west of 4th, and probably a short distance to the east of that, but like the coal at Morinville it does not cover a large area. It is, however, possible that throughout this district there may be isolated coal basins of the same geological horizon.'

'*Battle River.*—At the north of Meeting creek or Battle river there are large exposures of coal. On section 26, township 41, range 17, west of 4th meridian, mining has been carried on for some years by the settlers, although no regular mine has been opened. This work has also been continued along Battle river in this vicinity.'

'On the bank of Meeting creek there are large exposures of sandstone, 40 to 60 feet thick, in which there are some hard bands that could be quarried, but on the whole the rock is soft and easily disin-

tegrated. On section 28, township 41, range 17, two mines have been opened by a Mr. Heap. Two other mines have been operated in this township on sections 20 and 30 by Messrs. Fleming and Carruthers, respectively. The coal cropping out on Meeting creek does not exceed 5 feet in thickness and has an average section:—

Sandstone with band of ironstone nodules.
Shale roof.
Coal 4'-6".
Clay shale pavement.

The analysis of the coal is as follows:—

Moisture	11·68
Volatile matter	35·82
Fixed carbon	49·88
Ash	2·62
	100·00

From this analysis the coal is superior to that on Paint Earth creek.

'**Red Willow Creek.**—To the southwest on Red Willow creek is the famous Glen-Hayes Mining and Townsite Company's mine. This Company, I understand, own four and a half sections of land in township 40, range 18, west of 4th meridian. They have opened up mines in several places along the creek and at present are developing a new mine. The coal is about 4 feet thick, with a very tender roof and pavement. The coal seam lies below the level of the bed of the creek and on this account there is considerable trouble with water. A shaft was put down to the coal which passed through two seams, only one of them being workable. A townsite has been exploited at this point.'

A sample of this coal was obtained from Mr. Hayes in Edmonton after Mr. Smith's report was written. The analysis supplied by the Department is here inserted:—

Moisture	19·38
Volatile combustible matter	37·78
Fixed carbon	49·86
Ash	1·98
	100·00

This is remarkable in its low ash content even for a picked sample, so that the seam, although no doubt having bony streaks, must be a very clean coal.

'**Paint Earth Creek.**—The first mine here visited is operated by the Esperanza Coal Company, of Stellar, situated on SE ¼ section 18, township 39, range 15, west of 4th meridian. At the present time, September, 1908, there are three mines working, producing about 12 tons per day. The mine has been developed for an output of 50 tons per day. The mine is opened out on the edge of the road allowance between sections 17 and 18. The air shaft which they are now driving will come out on this road. The opening of the mine is about 40 feet above the level of Spruce creek, which is one of the many branches of Paint Earth creek.'

'The section here shows sandstone, below which is:—

Clay shale	1′–6″
Black shale	0′–2″
Coal	2′–2″
Clay mining	0′–2 to 4″
Coal	3′–6″
Sandstone pavement	

Analysis of coal as obtained from owners, (assayer not stated):—

Moisture	11·4
Volatile matter	38·9
Fixed carbon	44·8
Ash	4·6
Sulphur	0·3
	100·0

'Two other mines were visited, northwest in the same section, but were not working. Operators named Foster and Graves. Hoffman mine on section 8, township 39, range 15, has been well developed and is capable of an output of at least 50 tons per day. The coal at this point is similar in section and quality to that at the Esperanza mine.'

'Anderson and Grey have opened two mines in township 39, range 16, and have a capacity of 29 to 30 tons per day each and supply local demand.'

'Along the whole valley of Spruce creek and the coulées running into it the exposures are very prominent. The sandstones, which are from 40 to 60 feet in thickness, crop out prominently. When exposed inside the mine they appear very hard, but in the outer air disintegrate very readily. On another branch coulée of the Paint Earth coal has been found in sections 1 and 2 where the settlers have mined it for their own use.'

'**Beaverdam Creek to Sullivan Lake.**—On the SE ¼ section 3, township 38, range 14, west of 4th meridian, coal has been mined for the past two years. The cover here is only about 3 feet, and this is just scraped off, exposing 6 feet of coal, the upper bench being very soft.'

'Coal is exposed on the northwest side of Lanes lake and also on the northeast side of Sullivan lake. In both cases the coal is about 5 feet in thickness with very little cover.'

'A coal mine has been opened on section 2, township 28, range 14, by Mr. McVety, but little development has been done. An examination was made also of the sandstones outcropping on the Beaverdam and branch coulées at many points from its headwaters to the junction with the Battle river. These sandstones are all associated with the coal, a large strata overlying and underlying the workable seams. The rock changes in character at different points, due to some chemical action. Where the rock is whitish grey, it is very liable to disintegration, but where of a bluey or dark brown colour it withstands the action of the weather.'

'The strata underlying this large extent of country occupies a practically horizontal position. The country, intersected by creeks and coulées, discloses so many exposures that it is impossible to review them all or even visit all, but the facts cited above show it to be such an extensive deposit of lignite that it is nearly impossible to compute the amount of tonnage.'

'The coal seam varies in thickness from 4 to 6 feet with another 2 ft. unworkable seam underlying it at 20 to 40 feet.'

'The workable coal at an average thickness of 5 feet would yield 7,000 tons per acre. The best exposures are commonly assigned to ranges 15 and 16, township 39: this is undoubtedly the case as far as the working mines are concerned and the extent of the exposures. But the outcropping at various other points leads one to conclude that

the coal underlies a much greater area. In a well sunk on section 6, township 39, range 16, to a depth of 40 feet, a small seam of coal 10 inches thick was passed through at 21 feet. This is probably the upper seam, as in several wells in this vicinity the same bed of coal was passed through, varying in thickness up to two feet.'

Estimate of Coal.

From the sections shown on the diagram of borings, it is evident that the Clover Bar seam and the underlying one should represent an average of mineable coal amounting to about 7 feet, extending for some distance back from the river bank in the vicinity of the city. In places, as high as 14 feet of coal is believed to be present, but in other locations neither seam has been proven. The coals which lie above these two seams do not appear to be continuous over large areas, or the lack of definite information prevents their recognition in the different test holes. These seams should, however, add at different points considerably to the supply of available coal, and it seems fair to count on their being at some time mined locally as is the case at present in the Strathcona mine. In making an estimate, therefore, of 9 feet of available coal over a distance of seven or eight miles along the stream, and a mile on either side, a total of 80,000,000 tons of mineable coal seems within the bounds of possibility for the immediate vicinity of Edmonton.

Mines of the Edmonton District.

LEFT BANK OF RIVER.

Clover Bar Coal Company.—This Company is operating on south ½ section 18, township 53, range 23, west of 4th meridian. This lot is crossed by the Grand Trunk Pacific railway. The old mine was on the river bank on the outcrop of the seam, which was about 30 feet above the river. The old entry is being driven west to the western end of the lot, where a shaft is also being sunk which will be connected by a siding to the railway. About half way in the depression which crosses the lot to the north an air shaft has been constructed where the cover was only 35 feet. The coal at this point is 8 feet in thickness, about the maximum for this mine. In the old workings the seam is 7 feet 9 inches with a small parting of hard clay in the centre. In several places it is about 3 inches, but is generally very thin. Northward toward the railway the seam thickens and a maximum of 8 feet 4 inches is found.

The mining is all by pick undercutting the lower bench. The upper bench is left until the timber is being put in when it is pried down; the lower part of the stream looks the firmest, but there is little difference in any part.

At the new shaft where the tipple will be, the cover is 100 feet. In the depression in the centre of the property the least is 35 feet. Toward the Saskatchewan east it increases to 80 or 90 to near the outcrop on the face of the bank. A small 3 ft. seam was struck by the borings for pier foundations about 28 feet above this, but it may not be persistent.

The coal is a good lignite and the following analyses are furnished by Mr. F. B. Smith for samples taken within the mine in 1902:—

Moisture	12·2	13·8	17·0	17·0
Volatile matter	39·0	36·2	37·3	28·8
Fixed carbon	42·8	45·0	38·5	47·6
Ash	6·0	5·0	7·2	6·6
	100·0	100·0	100·0	100·0

Analysis by F. G. Wait of samples taken in 1908, shows:—

Moisture	19·82
Volatile matter	35·04
Fixed carbon	39·91
Ash	5·23
	100·00

These latter samples were kept in closed tins and, therefore, are less air dried. They should show the general quality of the coal as it comes from the mine. On both sides of the river above the Grand Trunk Pacific Railway bridge many small mines have been in existence for years. These have been working during the winter, mainly, and hauling their coal by team; several are still in existence on the west and north banks.

Ketchum Coal Mine.—The Clover Bar coal seam, on the NE ¼ of section 7, is mined by the Ketchum Company. The seam is reached by a slope on a 19 per cent grade and also by a vertical shaft. The coal varies in thickness from 6 feet 6 inches to 8 feet 6 inches.

Humberstone Mine.—Section 7, township 53, range 23, west of 4th meridian, has been mined by several individuals and companies:

F. Barnes had an old mine on this section. Humberstone mine on the NW ¼ had coal from 8 feet to 8 feet 6 inches, and a new company is preparing to operate on a larger scale.

Bush Mine.—The mine on the adjoining lot—river lot 42, Edmonton settlement—is called the *Bush mine.* In this the coal seam runs from 5 feet to 6 feet in thickness and is reported as decreasing in a southwest direction. The Brenner-Milner Coal Company is probably the operating company.

Rosedale Mine.—River lots 28 and 30. The Rosedale Coal Company is operating near the river by a shaft 40 feet to the Clover Bar seam, which is here below the level of the stream. The coal is about 5 feet at the north end of the mine, but toward the river decreases somewhat. A drill hole on the north end of the property is reported as having pierced this seam at a depth of 162 feet from the top of the bank, which shows that there is a general cover of that amount a short distance from the shaft opening.

Standard Mine.—River lot 26, Edmonton settlement. The mine of the Edmonton Standard Coal Company is reached by a shaft of 54 feet in depth at the mouth of Rat creek. The coal seam is the same as in Rosedale mine, the extension westward of the Clover Bar seam. It here lies 26 feet below the low water level of the river and is a 6 ft. seam. Another seam has been proven by a drill hole to lie 28 feet below the bottom of the Clover Bar seam; its thickness is 4 feet 6 inches. The sample taken from the working face, 1908, as an average of the seam, is reported by Mr. Wait as having:—

Moisture	16·49
Volatile matter	37·24
Fixed carbon	40·40
Ash	5·87
	100·00

Parkdale Mine.—River lot 22, Edmonton settlement. This mine is operated by a shaft 200 feet to the coal seam, which is the continuation of the Clover Bar seam. The coal here runs from 4 to 5 feet, generally a 4′-6″ seam. Below this at 20 feet is another of 4 feet thickness, but mining is confined to the top seam at present.

The equipment is capable of hoisting 500 tons per day if necessary, by a triple compartment shaft consisting of two hoisting compartments and a manway. The mine has been in operation nearly four years and considerable development work has been done. An air shaft is put down and fan installed. Mining is by compressed air punching machines.

Analyses of the coal show it to be very similar to that from other mines on this seam. Samples kept in tins show the following composition, analysis by Mr. F. G. Wait:—

Moisture	17·09
Volatile matter	34·39
Fixed carbon	38·45
Ash	10·07
	100·00

Analyses made for the Company by Mr. Richards, assayer for the Bankhead mines, give:—

Moisture	12·06
Volatile matter	35·74
Fixed carbon	47·31
Ash	4·89

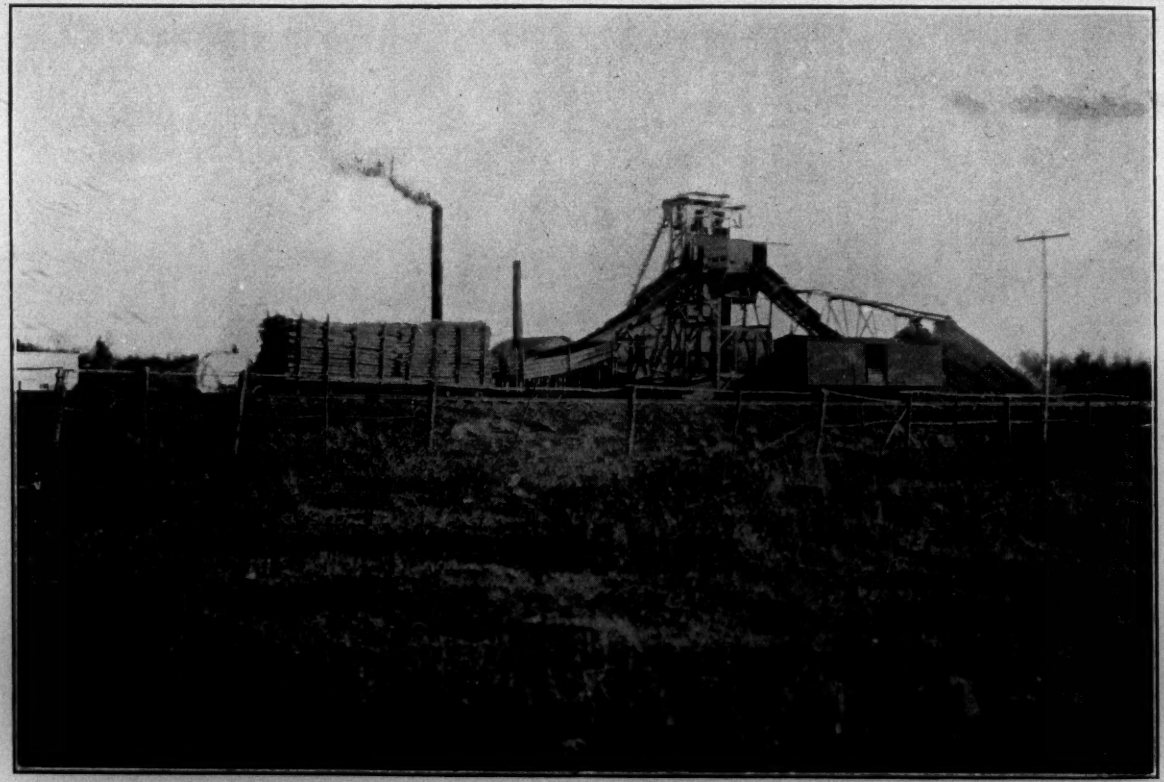
Ritchie Mine: formerly United Collieries.—River lot 20, Edmonton settlement. This mine was closed at the time of our visit and Mr. Fraser, inspector of mines, reports that the coal seam is the same as the Parkdale, but is thickened up to 6 feet. The shaft is 70 feet deep and the seam is about 50 feet below the river level. They have also proved the lower seam at a further depth of 30 feet, and found about 7 feet of coal. This property was later acquired by the Ritchie Coal Company and re-opened. New shafts and timbering were found necessary.

Milner Mine.—On river lot 20, one of the upper seams was worked by Mr. Milner. It is reported as being 55 feet above the river.

Baldwin Mine.—This is another of the abandoned mines on this lot. The seam is about 60 feet above the river and runs from 4 feet to 4 feet 6 inches in thickness.

Marsh and Nibbs.—River lot 18, Edmonton settlement. This mine is on one of the upper seams, which being only 3 feet 8 inches in

11662—p. 46.



Parkdale Coal Mine.

thickness has not been in operation since 1902. As samples could not be obtained I am indebted to Mr. F. B. Smith for the following analyses, which represent the varying character of this coal in three openings near one another:—

Moisture	28·7	15·6	14·6
Volatile matter	32·1	36·0	35·2
Fixed carbon	35·8	44·0	46·3
Ash	3·4	4·4	3·9
	100·00	100·00	100·00

Cameron Mine.—River lot 16, Edmonton settlement. On the face of the steep bank a 3 ft. seam was being mined in 1905, but seems to have been abandoned. Four seams appear to have been located here, the 3 ft. seam operated on, and 15 feet below this one of 3 feet 6 inches in thickness; both being about 100 feet or more above the river level. By boring, two seams below water level were located, one 3 feet thick about 30 feet below water, another 6 feet thick at 60 feet below water level. This latter appears to be the Clover Bar seam.

John Milner Mine—On river lot No. 16, a mine was opened in 1898 on an upper seam of 3 feet 6 inches in thickness, but has been abandoned.

MINES ON RIGHT BANK.

The Clover Bar seam outcrops on the right bank from the township line between ranges 23 and 24, west of the 4th meridian, down the river to the vicinity of the Grand Trunk Pacific bridge, and along this outcrop many small mines have been in existence for years. The advent of the railway will, by providing better means for transport, centralize the mining activity to the immediate vicinity of the line. Many of these small mines will cease operations unless spur railway lines are run to them, and even in that case, shafts will have to be put down and hoisting plants put in to bring the coal to the level of the railway. Near the Grand Trunk Pacific the land is owned by Philip Otwell, who has also been mining from the bank.

Otwell Mine.—On SW ¼ section 17, township 53, range 23. This is opposite the Clover Bar mine and on the same seam. The coal is between 7 and 8 feet in thickness.

Byers Bros. Mine.—On NW ¼ section 8, township 53, range 23. This, like the one above, is by level entry from the river bank on the 7 ft. Clover Bar seam. The coal is teamed to the city.

Fulton Mine.—On NE ¼ section 7, township 53, range 23. The Clover Bar seam is here about 8 feet thick. The parting in the seam is at 7 feet from the floor, so that by mining the lower portion a large part of the upper shelf may be left for a roof. The coal is taken out by level entry from river flat.

Daly and Lindsay Mine.—On NE ¼ section 7, township 53, range 23. This is also on the Clover Bar seam, which is here between 7 feet 6 inches and 8 feet.

Stewart or Milner Mine.—On SE ¼ section 7, township 53, range 23. This is similarly situated to the foregoing but the seam is lower as the dip is up stream. Seam varies from 7 to 8 feet.

Fraser and Freeman Mine.—On SE ¼ section 6, township 53, range 23. This is also on the same seam of coal, but the mine was closed when visited so that the thickness was not definitely ascertained.

Twyford Mine.—On SW ¼ section 6, township 53, range 23, The section of the seam near its outcrop along the river shows 1 foot 6 inches coal at top above a shale and clay parting of from 4 to 6 inches. Beneath this there is 7 to 7 feet 6 inches coal which is mined.

Near the water's edge above Fraser and Freeman's mine a block of coal has slidden from up the bank from a seam that may there be only part of a slide. It indicated an 8 ft. seam high up in the bank in this vicinity, and is probably one that was passed through in the drillings in section 6.

Frank Coal Company's Mine.—This is situated near the mouth of a ravine that reaches the river valley on river lot 31, Edmonton settlement. The Clover Bar seam is here below the level of the river and is reached by a shaft which starts about 12 feet above high-water level. The shaft is 40 feet and the coal mined is about 4 feet.

Dawson Mine.—This is situated on the river flat opposite but above the Standard mine. It is on river lot 27 or 29 and the coal seam is reached by a shaft of 90 feet. The Clover Bar seam here is 6 feet and the lower one of 6 or 7 feet is found at 107 feet.

Martin Mine.—One of the abandoned mines on an upper seam above the Dawson mine.

Baldwin Mine.—Two abandoned mines near the mouth of Dowlers creek were operating on upper seams. Near the river a small seam was seen to outcrop, and by boring a 3 ft. seam was found 15 feet below river level.

Twin City Mine.—This mine is situated on the line of the Edmonton, Yukon and Pacific railway, the small connecting link between Edmonton and Strathcona. By putting their shaft alongside the track they will be able to ship coal to outside points. The property consists of parts of river lots 17 and 19. These lots have been tested by boring and two seams are located. Unfortunately the location taken for a shaft is probably on the poorest portion of these seams, but it is to be hoped that the partings there found will thin out to the north. The work of erecting plant was only in progress, but the installation is planned to include Rand air compressor, 85 horse-power water tube boilers, 35 horse-power hoisting engine, shaking screens, etc.

The coal of the lower seam is that which it is proposed to mine, and a sample from the shaft gave Mr. Wait the following composition.—

Moisture	16·61
Volatile matter	37·24
Fixed carbon	39·10
Ash	7·05
	100·00

Strathcona Mine.—This is the only working mine in Edmonton that is mining coal from one of the upper seams. It is situated on the slope of the hill on river lot 9 in Strathcona. The seam is reached by a shaft 94 feet to top of the coal. The mine is not at present connected with the railway, but will not be far from the projected spur, from the Canadian Pacific present terminal in Strathcona, to connect with Edmonton railways by a high level bridge. The construction of this railway will add nearly 100 feet to the amount of

haulage for the coal to the level of the track, and possibly mean a new shaft. The present mine is well equipped with hoisting machinery, but the surface haulage is by team.

The coal seam averages 5 feet, but thins somewhat near the outcrop; southward it maintains its thickness. The coal is very clean, but contains considerable moisture. The following is Mr. Wait's analysis:—

Moisture	18·37
Volatile matter	36·73
Fixed carbon	40·40
Ash	4·50
	100·00

In sinking the shaft a 4 foot 6 inch seam was cut at the level of the top of the shaft, and by drilling near the lower slope of the hill a 7 ft. seam, the Clover Bar seam probably, was found 92 feet below the one at present worked.

Head of Mill Creek, Strathcona.—Among the mines abandoned or not at present working, it is interesting to note that just beneath the surface, blocks of coal, apparently isolated drift pieces, have been found. One of these was located on the J. Emery farm on section 22, township 52, range 24, west of 4th meridian, and when dug into showed a thickness of 9 feet. A mine was started, but the entry went through the block, and it was proved by boring around it that there were only about 100 tons of it. This was resting on the stratified coal-bearings rocks, the surface of which appeared to have been irregularly eroded. It was covered by sands and clays of drift origin, and if the block of coal was not a remnant of an eroded seam it might well have come from the heavy seam that occurs near the surface on section 6, township 52, range 23. Other occurrences of drift coal were also reported by Mr. Chas. Taylor of Edmonton. A sample of this drift when analysed showed very little difference from the coals of the seams above the Clover Bar seam. The following is the result furnished by Mr. Wait:—

Moisture	17·08
Volatile matter	38·36
Fixed carbon	41·02
Ash	3·54

Larry Garneau Mine.—This is an abandoned property on river lot No. 7, west of the Strathcona mine. The seam worked was a thin one of the upper series.

MINES NEAR EDMONTON.

White Star Mine.—This mine and the character of the coal has been noted under the coal of the upper seams. The mine is reached by a short slope for which a small steam plant has been installed. The ventilation is by fan run by gasoline power and seems adequate for the output. As the mine has as yet no railway connexion, its equipment seems large enough for the local demand, which though by team to Strathcona, will maintain its market, since many prefer its burning qualities to that of the local coal.

Namao Mine.—Namao Coal Company, operated by Cannell Spencer Construction Company. This mine is situated on the east side of Sturgeon valley on the outcrop of the seam. The entry is on the level, and the seam is reported as being 5 feet of coal separated by a 2 ft. bone, and has a soft roof. Mr. Smith's analyses are repeated:—

Moisture	13·0	15·8
Volatile matter	38·8	38·7
Fixed carbon	42·7	42·2
Ash	6·5	3·3
	100·00	100·00

The mine is on west ½ section 3, township 55, range 24, west of 4th meridian.

Curwen and Kelly Mine.—This consists of a drift from the west bank of Sturgeon river on SE ¼ section 8, township 55, range 24, west of 4th meridian, and is the same seam that is found again farther north at Smith's mine. The coal is hauled by hand to a tipple for wagons. Ventilation shafts are being sunk from up the bank. The seam runs from 4 feet 10 inches to 5 feet. Analysis by fast coking gave average of seam:—

Moisture	17·42
Volatile matter	37·02
Fixed carbon	40·83
Ash	4·73
	100·00

The best sample, which was bright coal, seemed more compact and gave:—

Moisture	9·51
Volatile matter	39·05
Fixed carbon	46·78
Ash	4·66
	100·00

Smith's Mine.—On the northern part of section 8, township 55, range 24, west of 4th meridian, the seam that Curwen and Kelly have started to mine has been mined by Mr. F. Smith. It is thicker in this part of the section and reaches 7 feet on the bank of a small gully running to Sturgeon river. In the mine the seam averages 6 feet, the coal is hauled up a shaft about 60 feet deep by a portable engine and is stored in a large bin. The market is purely local and the coal is hauled away by teams. The ventilation is by open drifts to the coulée to the north.

Morinville Mines.

Cardiff Mine.—Two mines are operating about two miles south of Morinville. The seam here is from 10 to 15 feet thick. On the NW ¼ section 24, township 55, range 24, west of 4th meridian, there are three shafts to the mine of the Cardiff Coal Company. As the parting in the seam is low down it is mined out and a total of 10 feet of coal is taken out. The cover at the southern shaft is 45 feet, but is less toward the north. Large timbers being required they are taken in by a slope. This and the Alberta mine are connected by spur to the Morinville branch of the Canadian Northern railway, and as the mines are well opened out the output will soon be large. The coal that is taken out is divided by a clay parting and the lower part is much firmer.

Analyses of samples:—

	From top bench.	From lower bench.
Moisture	17·74	9·44
Volatile matter	36·66	38·87
Fixed carbon	39·91	45·25
Ash	5·69	6·44
	100·00	100·00

Alberta Mine.—NE ¼ section 23, township 55, range 24, west of 4th meridian. A slope runs down about 25 feet below general level. The seam, which sometimes runs over 12 feet in thickness, is not all mined. The parting in the coal is 6 feet from the bottom, and it with the upper coal makes a good roof; the lower coal leaves it freely when mined from the bottom. Electric undercutting machines take out about 4 inches of the lower shale so that the 6 feet that are mined come out in large blocks. The main haulage way is lighted by electricity, which is supplied by the plant.

A sample of the coal gives an analysis as follows:—

Moisture	18·11
Volatile matter	36·64
Fixed carbon	41·90
Ash	3·35
	100·00

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1002. Special Map of Rossland. Geological sheet. Scale 400 ft. = 1 in.
1003. Rossland Mining camp. Topographical sheet. Scale 1,200 ft. = 1 in.
1004. Rossland Mining camp. Geological sheet. Scale 1,200 ft. = 1 in.
1068. Sheep Creek Mining camp. Geological sheet. Scale 1 m. = 1 in.
1074. Sheep Creek Mining camp. Topographical sheet. Scale 1 m. = 1 in.
1095. 1A.—Hedley Mining district. Topographical sheet. Scale 1,000 ft. = 1 in.
1096. 2A.—Hedley Mining district. Geological sheet. Scale 1,000 ft. = 1 in.
1105. 4A.—Golden Zone Mining camp. Scale 600 ft. = 1 in.
1106. 3A.—Mineral Claims on Henry creek. Scale 800 ft. = 1 in.
1125. Hedley Mining district: Structure Sections. Scale 1,000 ft. = 1 in.

ALBERTA.

594-596. Peace and Athabaska rivers, scale 10 m. = 1 in.
*808. Blairmore-Frank coal-fields, scale 180 ch. = 1 in.
892. Costigan coal basin, scale 40 ch = 1 in.
929-936. Cascade coal basin. Scale 1 m. = 1 in.
963-966. Moose Mountain region. Coal Areas. Scale 2 m. = 1 in.
1010. Alberta, Saskatchewan, and Manitoba. Coal Areas. Scale 35 m. = 1 in.
1117. 5A.—Edmonton. (Topography). Scale ½ m. = 1 in.
1118. 6A.—Edmonton. (Clover Bar Coal Seam). Scale ½ m. = 1 in.
1132. 7A.—Bighorn Coal-field. Scale 2 m. = 1 in.

SASKATCHEWAN.

1010. Alberta, Saskatchewan, and Manitoba. Coal Areas. Scale 35 m. = 1 in.

MANITOBA.

804. Part of Turtle mountain showing coal areas, scale 1½ m. = 1 in.
1010. Alberta, Saskatchewan, and Manitoba. Coal Areas. Scale 35 m. = 1 in.

*Publications marked thus are out of print.

ONTARIO.

227. Lake of the Woods sheet, scale 2 m. = 1 in.
*283. Rainy Lake sheet, scale 4 m. = 1 in.
*342. Hunter Island sheet, scale 4 m. = 1 in.
343. Sudbury sheet, scale 4 m. = 1 in.
373. Rainy River sheet, scale 2 m. = 1 in.
560. Seine River sheet, scale 4 m. = 1 in.
570. French River sheet, scale 4 m. = 1 in.
*589. Lake Shebandowan sheet, scale 4 m. = 1 in.
599. Timiskaming sheet, scale 4 m. = 1 in. (New Edition 1907).
605. Manitoulin Island sheet, scale 4 m. = 1 in.
606. Nipissing sheet, scale 4 m. = 1 in. (New Edition 1907).
660. Pembroke sheet, scale 4 m. = 1 in.
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*750. Grenville sheet, scale 4 m. = 1 in.
770. Bancroft sheet, scale 2 m. = 1 in.
775. Sudbury district, Victoria mines, scale 1 m. = 1 in.
*789. Perth sheet, scale 4 m. = 1 in.
820. Sudbury district, Sudbury, scale 1 m. = 1 in.
824-825. Sudbury district, Copper Cliff mines, scale 400 ft. = 1 in.
852. Northeast Arm of Vermilion Iron ranges, Timagami, scale 40 ch. = 1 in.
864. Sudbury district, Elsie and Murray mines, scale 400 ft. = 1 in.
903. Ottawa and Cornwall sheet, scale 4 m. = 1 in.
944. Preliminary Map of Timagami and Rabbit lakes, scale 1 m. = 1 in.
964. Geological Map of parts of Algoma and Thunder bay, scale 8 m. = 1 in.
1023. Corundum Bearing Rocks. Central Ontario. Scale 17½ m. = 1 in.
1076. Gowganda Mining Division, scale 1 m. = 1 in.

QUEBEC.

*251. Sherbrooke sheet, Eastern Townships Map, scale 4 m. = 1 in.
287. Thetford and Coleraine Asbestos district, scale 40 ch. = 1 in.
375. Quebec sheet, Eastern Townships Map, scale 4 m. = 1 in.
*571. Montreal sheet, Eastern Townships sheet, scale 4 m. = 1 in.
*665. Three Rivers sheet, Eastern Townships Map, scale 4 m. = 1 in.
667. Gold Areas in southeastern part, scale 8 m. = 1 in.
*668. Graphite district in Labelle county, scale 40 ch. = 1 in.
918. Chibougamau region, scale 4 m. = 1 in.
976. The Older Copper-bearing Rocks of the Eastern Townships, scale 8 m. = 1 in.
1007. Lake Timiskaming region, scale 2 m. = 1 in.
1029. Lake Megantic and vicinity, scale 2 m. = 1 in.

NEW BRUNSWICK.

*675. Map of Principal Mineral Occurrences. Scale 10 m. = 1 in.
969. Map of Principal Mineral Localities. Scale 16 m. = 1 in.

NOVA SCOTIA.

*812. Preliminary Map of Springhill coal-field, scale 50 ch. = 1 in.
833. Pictou coal-field, scale 25 ch. = 1 in.
897. Preliminary Geological Plan of Nictaux and Torbrook Iron district, scale 25 ch. = 1 in.
927. General Map of Province showing gold districts, scale 12 m. = 1 in.
937. Leipsigate Gold district, scale 500 ft. = 1 in.
945. Harrigan Gold district, scale 400 ft. = 1 in.
995. Malaga Gold district, scale 250 ft. = 1 in.
1012. Brookfield Gold district, scale 250 ft. = 1 in.
1019. Halifax Geological sheet. No. 68. Scale 1 m. = 1 in.
1025. Waverley Geological sheet. No. 67. Scale 1 m. = 1 in.
1036. St. Margaret Bay Geological sheet. No. 71. Scale 1 m. = 1 in.
1037. Windsor Geological sheet. No. 73. Scale 1 m. = 1 in.
1043. Aspotogan Geological sheet. No. 70. Scale 1 m. = 1 in.

NOTE.—Individual Maps or Reports will be furnished free to *bona fide* Canadian applicants.

Reports and Maps may be ordered by the numbers prefixed to titles.

Applications should be addressed to The Director, Geological Survey, Department of Mines, Ottawa.

*Publications marked thus are out of print.

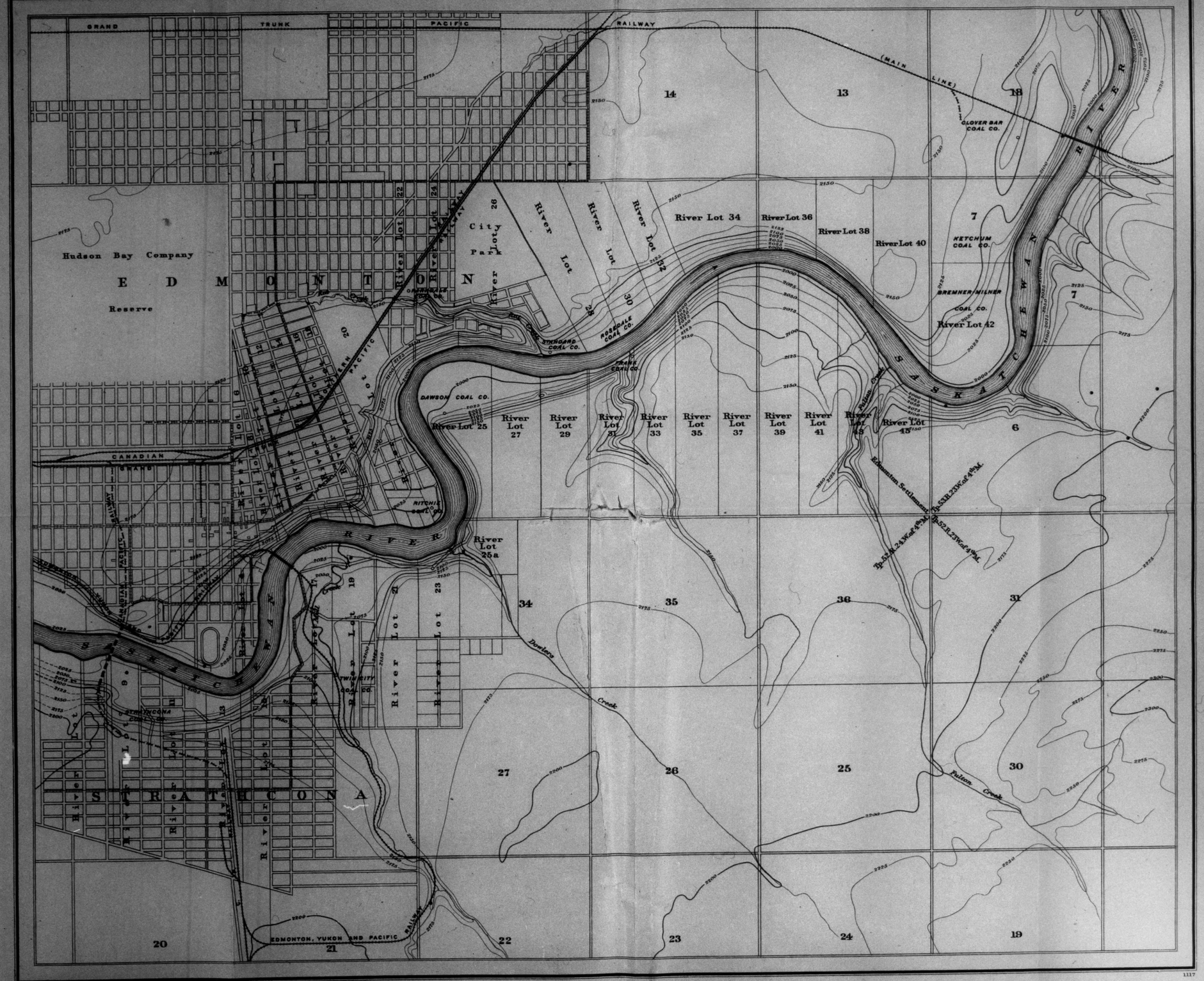
Canada
Department of Mines
GEOLOGICAL SURVEY

HON. W. TEMPLEMAN, MINISTER; A. P. LOW, DEPUTY MINISTER;
R. W. BROCK, DIRECTOR.

1910

TOPOGRAPHY

ALBERTA



LEGEND

Culture

- Roads
- Railways
- Railways projected
- City Tramways
- City Tramways projected
- Bridges
- Shafts
- Borings

Water

- Rivers and creeks

Relief

- Contours (showing land forms and elevations above sea level); interval 25 feet

Magnetic declination about 25° East

C. O. Senécal, *Draughtsman and Chief Draughtsman.*
A. Dickson, *Draughtsman.*

MAP 5A

EDMONTON
ALBERTA

Scale: 500 Miles to 1 Inch.

Scale: 1/31680
Feet
Metres

2640 FEET TO 1 INCH

Sources of Information

City of Edmonton	*Published map by Messrs.* Driscoll *and* Knight
City of Strathcona	*Published map by* R. W. Lendrum
Settlement of Edmonton and Townships	*Plans,* Department of the Interior
Contours *(subject to revision)*	*Plans,* Grand Trunk Pacific Railway
Compilation	D. B. Dowling

To accompany Memoir No. 8.

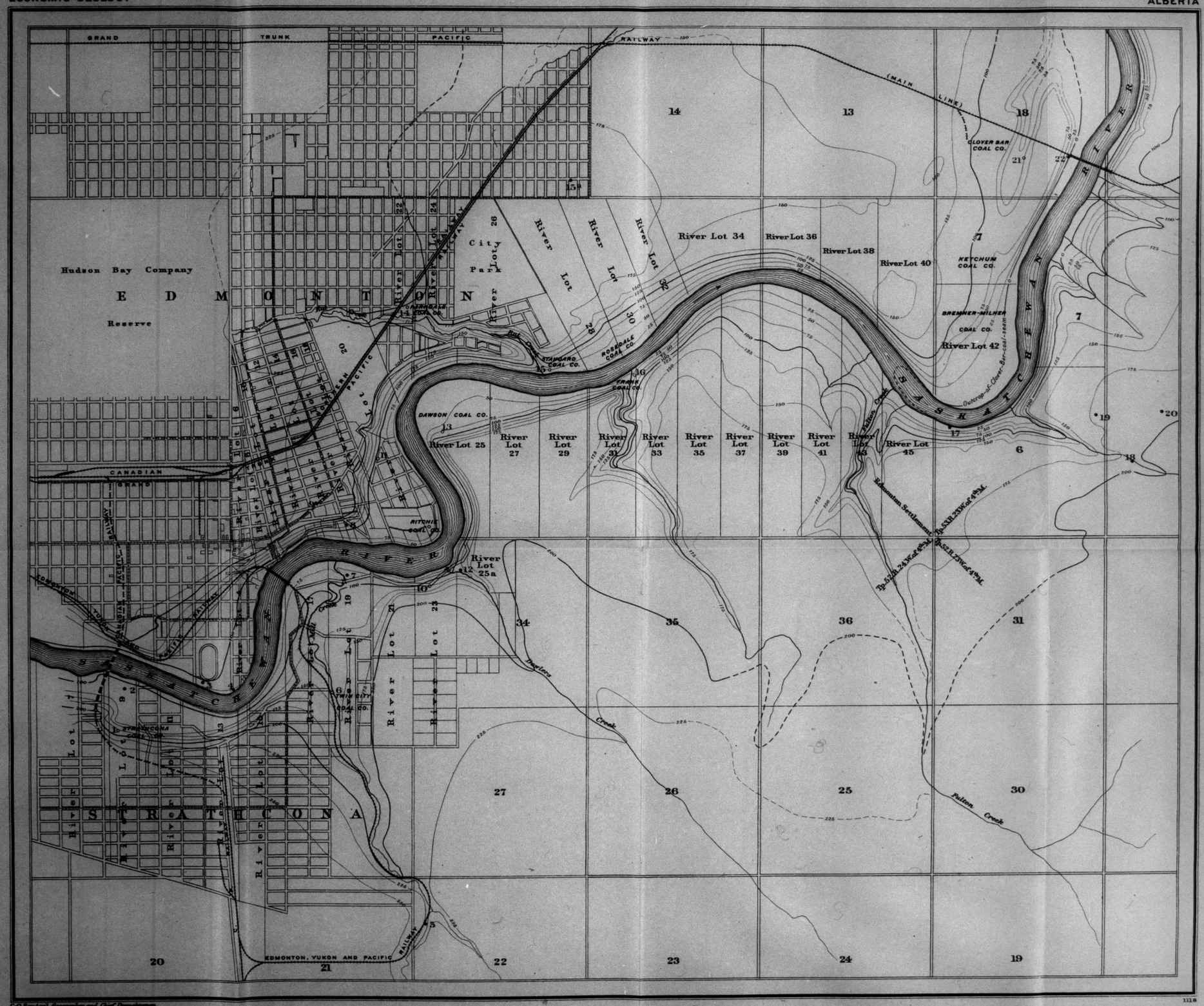
Canada
Department of Mines
GEOLOGICAL SURVEY

Hon. W. Templeman, Minister; A. P. Low, Deputy Minister;
R. W. Brock, Director.

1910

ECONOMIC GEOLOGY

ALBERTA



C. O. Swaisland, Geographer and Chief Draughtsman.
A. Dickison, Draughtsman.

1118

LEGEND

Isobaths (showing inferred depth in feet below surface of Clover Bar coal seam)

Isobaths (showing probable depth in feet below surface of Clover Bar coal seam)

6 15 Numbers (referring to borings and shafts as numbered in Memoir)

LEGEND

Culture

Roads

Railways

Railways projected

City Tramways

City Tramways projected

Bridges

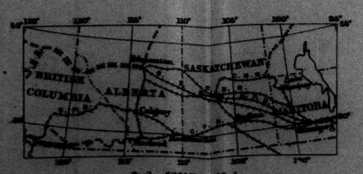
Shafts

Borings

Water

Rivers and creeks

Magnetic declination about 25° East



Scale: 500 Miles to 1 Inch.

MAP 6A

EDMONTON
ALBERTA

Isobathic Lines showing cover over "CLOVER BAR" COAL SEAM

Scale: 1/10560

Feet

Metres

2640 FEET TO 1 INCH

Sources of Information

City of Edmonton	*Published map by Messrs Driscoll and Knight*
City of Strathcona	*Published map by R. W. Lendrum*
Settlement of Edmonton and Townships	*Plans, Department of the Interior*
Isobathic Lines (subject to revision) Based on elevations of G.T.P.Ry.	D. B. Dowling
Compilation	D. B. Dowling

To accompany Memoir 37 E.